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Deliberately Made Agreements Must be Lived up to.

Elsewhere in this issue we publish a statement by the National Cash Register Company regarding the troubles that have occurred in its shops. We have published so much regarding this establishment that naturally anything that takes place in it is of more interest than perhaps the same thing would be in another shop.

In the first place, we may remark that it is inconceivable that such a statement should be made and signed by the president of the company, unless it is a carefully prepared and accurate statement of fact. And granting the accuracy of the statement we think it must be conceded that the maker of it must be capable of taking a very unusually broad and liberal view of the rights of working men, or he never could have said at the beginning what he does say regarding the attitude of his company toward unions, in view of his experience with them.

The statement is well worth careful study. Many manufacturers who read it will undoubtedly say that the way to deal with such troubles is to rigidly exclude union men from their factories and have nothing whatever to do with them. Very few manufacturers could have passed through such an experience as is related by Mr. Patterson and still retain the belief or express the opinion that labor unions can possibly serve any useful purpose whatever. The record is one of repeated, deliberate violations of written contracts and of refusals to arbitrate difficulties, for which we can imagine no possible valid excuses.

The records of the Metal Trades Association show (and we have seen no denial) that that association offered to submit the interpretation of the New York agreement to a board of arbitration, and that as the New York agreement contains a claim forbidding strikes or lockouts pending the decision of an arbitrable question of dispute, therefore the officers of the I. A. M. violated their agreement, and it is on this ground that the N. M. T. A. is fighting.

All we can say is that there can be no two opinions as to whether a deliberately made agreement should be lived up to or not. All business relations worth preserving are based upon the fact that men are to be found that are honorable enough to live strictly up to an agreement. The business of the "American Machinist" with its contributors, readers and employees is based upon that fact, as is all legitimate business, and there can be no other foundation upon which to build up permanent and satisfactory business relations. Workingmen, members of unions and officers of such unions who do not realize the importance of this, from a purely selfish, dollars-and-cents point of view, to say nothing of its moral aspect, must surely learn it by bitter and disastrous experience.

Something like a riot occurred last week in Plainfield as a result of a machinist having gone to work at the shops of the Pond Machine Tool Company. He was guarded by police on his way to and from the shop, but there was a good deal of hooting and jeering at him by women and children, as well as men and finally some throwing of sticks and stones. This led to a proclamation by the mayor and to a disavowal of responsibility for the disturbance by the strikers, who claim that none of their number took part in the demonstration.

We publish elsewhere in this issue a letter, signed "Employer," which we consider worthy of careful attention. Though written by one employer of labor, whose name, if we were at liberty to reveal it, would be known to most of our readers, we happen to know that it represents the views of very many other employers, and we may also add that it comes very near an exact expression of our own views.

We have a letter from the Dodge Manufacturing Company, of Mishawaka, Ind., and from other manufacturers endorsing the protest made by the Lane & Bodley Company and which was published in our issue for June 13. It seems that the manufacturers who have contributed to the power plant in Buffalo are generally very much dissatisfied with the way this power plant has been installed and located, though it is doubtful if they will succeed in getting much satisfaction.

"The National Cash Register Company's Experiment."

I have carefully read Mr. Halsey's article entitled as above and agree with him that there should be as little as possible of the patriarchal relation between the American workman and his employer. That is to say, I think it is, or at least ought to be, no more the business of the employer to look after the welfare of his employees outside the shop than it is the business of the employees to look after the welfare of the employer outside the shop. But while this is all right as a principle, the fact remains that men who have opportunities and are able and disposed to help their fellow-man to a higher plane of living have usually been commended for doing so, and if an employer feels so disposed and can help especially his unskilled and therefore lower paid employees in any way, it seems to me he ought to be able to do it without wounding their feelings or injuring their self-respect, especially if tact is used, as it must be in such cases.

It is Mr. Halsey's habit to look at questions relating to shop management from a strictly business point of view. That is the safer way to regard them, of course, because it is only those advances made that are sanctioned and sustained by strict business principles and business experience that are secure and that may be considered as among the permanent attainments of industrial progress. But it should not be overlooked that the Patterson brothers declare that what they have been doing at Dayton does pay. "It pays" is a frequent and emphatic declaration of theirs and to me it seems rather difficult to distinguish the particular features of their works that may possibly produce a bad effect from those that produce a good one. Mr. Halsey does not men-

tion baths as one of the features that he objects to and yet these are, it seems to me, more open to objection than the "rest rooms" for the girls which he does object to. For, with the possible exception of smiths, molders and others whose work is necessarily dirty and at the same time must be done in hot places, shop baths are not badly needed and the necessary bathing can be done at home—in fact, probably should be done on rising in most cases, while it seems to me that for a factory employing so many girls as are employed at Dayton the rest room, to which they can retire at times and lie down for a few minutes or longer, as may seem necessary, is a real necessity and ought to be a feature of every factory where considerable numbers of girls are employed. It is not merely altruistic but ought to be looked upon as a physical necessity.

Wages have been high at the National Cash Register shops, and as to making them higher I do not see the difference in principle nor in probable effect between paying wages that are much higher than is necessary to get the best class of help and bestowing gifts or bonuses in other ways.

As to the flower beds and landscape gardening, they are in the first place not solely for the employees; they are for the purpose of having an attractive establishment in which the proprietors and all who are interested can take some pride and satisfaction. I cannot see why this is not as proper and as justifiable from the manufacturer's standpoint as are flowers and landscape gardening about his residence, nor why the one should be objected to by the workmen more than the other. I spent many years in workshops and feel quite sure that so long as my employer paid me the ruling rate of wages—as much as I could command elsewhere—I should not ask him to let the shop yard be ornamented with cinders, dirt or weeds in order to pay me still higher wages, any more than I would ask him to deny himself of things he could afford to have about his own house in order to pay me wages higher than the ruling rates.

As to the prizes, I believe all the suggestions or ideas used are paid for at Dayton, and I do not see that the term "prize" is or should be objectionable. Students in colleges, artists, athletes, writers, etc., strive for and win prizes, value them highly when won, and I never heard of such prizes lowering their self-respect or causing hatred to spring up between the prize winners and the prize givers.

At the Detroit meeting of the National Association of Manufacturers, I talked with F. J. Patterson, the vice-president of the National Cash Register Company (with whom I had the pleasure of some previous acquaintance) about the trouble there. He did not seem nearly so much excited or worked up about it as might have been expected, nor as much as are many others whose interest in it is much less. He told me that the article in "The Sun," of New York, which has been quoted far and wide to show the enormity of the men's doings was, as he put it, "too sarcastic" and then in reply to inquiries gave me instances in which this article grossly misrepresented the facts. I remember particularly the towel incident which seemed in "The Sun's" account to be especially outrageous, but which he put an entirely different aspect upon by telling me the truth of it, which "The Sun" did not do by any means. But the attitude of Mr. Patterson, which has a bearing upon the present discussion, is shown by the fact that when a third person came up and remarked that everyone would have thought that the Dayton shop would have been the last one in which such a trouble would have occurred, he said that "only about 150 men had struck out of over 2,300 employees; the rest were all satisfied." And he did not seem to at all regard the so-called altruistic features of the establishment as a failure.

Then he went on to explain that the whole recent trouble sprang from opposition to the foreman of their brass foundry (McTaggart) on the part of the molders' and other unions. McTaggart was foreman of the brass foundry of the Yale & Towne Company some years ago when that company had a particularly bitter fight with the unions. During the fight McTaggart incurred the undying hatred of the union men. Just how or what he did, I do not know and don't know that Mr. Patterson knew, but at any rate he said that the trouble sprang from that fact. Of course it follows that if the union is down on McTaggart, McTaggart is down on the union, and that fact affords a good opportunity for the charge that the men laid off on account of slackness of work were selected by McTaggart for their devotion to union interests. I do not mean to say that they were so selected, but only that the conditions were such as to make it almost sure that such charges would be made.

I relate all this simply to show that the causes of the trouble assumed by Mr. Halsey seem to have no existence, but that in the opinion of those best qualified to judge, the trouble was due to entirely different causes, and not at all to the influence of the flower beds, rest rooms, etc., or to any notion generally held by the men that the money spent in these features should have been paid them in increased wages.

Mr. Halsey closes with a reference to what he calls his hobby, the "Premium Plan." I too believe in that, but do not believe it can do away with all industrial troubles. Perhaps I may be permitted to briefly refer here to my own hobby. At the Detroit meeting of the National Association of Manufacturers Dr. Tolman delivered a lecture on "What more than wages." Among other views thrown upon the screen were some illustrating the National Cash Register Company's works and particularly showing the condition of some of the back yards in the vicinity of the factory before and after the Patterson brothers had stimulated the boys to turn these yards into gardens that are beautiful instead of dreary deserts of mud and refuse, as they formerly were. The contrast was very strong and the pictures were very impressive. Dr. Tolman, in speaking of them, said, among other things, that he had written to a real estate agent in Dayton for information as to the effect of all this upon the value of land in the neighborhood, and this real estate man had replied that it was now easy for him to get 20 to 30 per cent. more for property than before it was thus made attractive. Now this simply means that those workmen who wish to secure homes near this factory must pay 20 to 30 per cent. more for them in rents or in purchase price, because the Pattersons and the boys have done certain work there tending to make the place more attractive, and the company if it should need more land would have to pay the same advance for the same reason. And this money goes to those who do in return for it nothing whatever either to supply the world with cash registers or anything else, or to beautify the homes of those who do; they need only sit and wait and mark up their prices, as the improvements made by others increase the demand for places in which to work and to live or to carry on business, and just here in my opinion is the feature of the case which bears most heavily both upon manufacturers and their workmen that constantly and unnaturally restricts the opportunities for work and for carrying on useful business by charging for the use of that necessity of life which no man has made "all the traffic will bear." This is not the place to discuss this matter at length, but those who have given any attention to the question of how much real right mere monopolists of the earth's surface have to charge others for the privilege of living and working upon it will readily understand what I mean and will know that this is a question that goes far deeper and means much more to both workmen and employers —all in fact, who do anything useful—than any question of the method of paying wages or of unions or anti-unions can possibly go or mean.

FRED J. MILLER.

Practical Theses Subjects.

We have noted with a good deal of gratification the unusually practical nature of a large proportion of the subjects of theses presented by candidates for gradution at this year's commencement exercises at Lehigh University.

Among eighteen subjects of theses for the degree of Mechanical Engineer we note the following:

Design of a Tugboat for the Amazon.

The Adoption of Jigs in Machine Shops as a Labor-Saving Device.

The Mechanical Fallacies Involved in "Poleforcia."

Design of an Air Compressor Plant for the Foundry and Machine Shop of Monongahela Manufacturing Company.

Piece-Work System.

Design for a 600-ton Coaling Station for the Lehigh Valley Railroad at South Easton, Pa.

Design of a Rotary Cement Kiln.

Comparative Cost and Efficiency of Compressed Air as Motive Power.

Design of a Bevel Gear Planer.

Tool Steel.

At Logansport, Ind., recently a barrel of whiskey caught fire, exploded and killed two men. It is a question whether this should or should not be included in the list of boiler explosives. It seems to have been clearly a case of too much pressure of vapor, too little strength and no safety valve.

The Lane & Bodley Company, Cincinnati, Ohio, issue what they call a Fiftieth Anniversary Announcement, which is a leaflet containing an illustration of a vertical engine built by that company in 1851 and an engine built by the same company in 1901. The contrast between the two engines is interesting and there is some information as to Lane & Bodley Company's ideas of what a twentieth century Corliss engine should be like.

Commercial Review.

NEW YORK, Monday, June 24.

ELECTRICAL AND OTHER MACHINERY.

One of the most interesting news items for some time past is the announcement just made that the General Electric Company has acquired control of the British Thomson-Houston Company, Ltd. This was done by buying out the French and German holdings. The British Thomson-Houston has hitherto been operating under General Electric patents, but with independent managament. The General Electric has executed considerable large work for the English concern, but the latter has of late been increasing its facilities. This extension, together with the erection of the works of Dick, Kerr & Co. and the British Westinghouse Company, have promised a formidable increase of the foreign competition of the General Electric Company, in view of which it looks as if the maximum of its extraordinary growth must be reached ere long. The acquisition of control of its English counterpart may, however, give it fresh advantages in the struggle for foreign trade. The stock of the General Electric Company last week made a new record of 265 per cent., which is more than double its price a year ago. The Westinghouse Electric & Manufacturing Company is understood to be superlatively busy at its works.

With a few exceptions the dynamo and motor builders who control most of the business in this territory have been little bothered with the machinists' strike. The labor difficulty has not noticeably lessened demand for electrical apparatus, although in some instances orders have been diverted owing to the inability to promise satisfactory deliveries. The volume of domestic trade in direct-current machines is highly gratifying. Orders are coming in better than they did in the early months of the year and about as well as a year ago, or possibly somewhat better. The season has now been entered when numerous contracts are let for lighting plants to be installed in the fall, and this accounts largely for the briskness of demand. The stationary motor trade is running along smoothly, but is less a feature than it would naturally become in the course of a couple of months. For isolated lighting plant work in this city the future looks even brighter than the present. There are numerous new buildings in process of construction or to be constructed both down and up town, which will call for plants, but most of them will not be ready to place their orders before next fall or spring. Bids are now being put in for the plant of the new Hall of Records on which bids have already been received and rejected on one or more occasions covering a year's time. Such of the former bids as might have proved satisfactory to the powers that be did not come within the appropriation and this had to be raised before the subsequent ones were taken. The Mutual Life Insurance Company is about to issue specifications for the plant to go in its large new annex. Bids have just been opened for a 300-kilowatt generating set for the Brooklyn Navy Yard.

In spite of the fact that demand for electrical machinery is good, prices are irregular, not being in all cases held as firmly as they might be. Some sellers do not admit reductions while others make sweeping statements and say that when anxious to secure an order, even the most conservative bidders will give concessions.

The condition of export trade is variously reported. The Bullock people pronounce it active. They have just been making shipments of numerous machines to South America and England and are receiving inquiry from the Far East. While Japan is rather quiet for the time China is calling loudly for electrical material and some of it is for factory purposes. The optimism here expressed in regard to the foreign field is not, however, universal and it is stated in another quarter that the effects of German competition are keenly felt.

The C & C Electric Company regard the Middle States as at present more active than New England or the West. They have received a good run of orders among which are those for a number of generators and motors to go in factories of John Wanamaker, Philadelphia; a 35 horsepower series-parallel equipment for the Peoria (Ill.) "Star"; two 125-kilowatt generators to go with Russell engines in the plant of the Merchants' Light, Heat & Power Company, York, Pa., and a 75-kilowatt generator for power and lighting in the works of the Exeter Machine Company, Pittston, Pa.

H. B. Coho & Co. have sold for export to the Argentine Republic a 200-kilowatt Eddy generator with motors.

The Prentiss Tool & Supply Company, of New York city, will open in July a branch with showroom space at 200 Franklin street, Boston, Mass. They have the exclusive agency for the New England territory of the following tool manufacturers among others: Cincinnati Milling Machine Company, Bickford Drill & Tool Company, Lodge & Shipley Machine Tool Company, Cincinnati Planer Company, Cincinnati Machine Tool Company, B. F. Barnes Company and others.

The Mesta Machine Company, Pittsburgh, Pa., has given out contracts amounting to $40,000 to the Niles-Bement-Pond Company and the Betts Machine Company for new machinery.

The quietness in government contracts for machine tools for the navy, especially in this part of the country, is funereal. The attack of military work which accompanied and followed the Spanish War, seems to have passed over for the time being.

The New Process Raw Hide Company, Syracuse, N. Y., reports the export sales of its New Process Pinions as rapidly increasing. The company has recently shipped 100 electric railway pinions for G. E. motors to London on an order from an electrical supply house in that city. The pinions are to be used on one of the big railways recently built there. A shipment of pinions has also been made to the Albion Motor Company, an English automobile company. In the general machinery line the company has just shipped a number of big bevel gears, both iron and rawhide, some of the latter as large as 32-inch diameter, to one of the leading English shipbuilding companies. A number of railway pinions have been shipped to Germany and Norway and reports from those countries say that the demand for them is increasing. Several inquiries for catalogs and prices have lately been received from Japan. A good-sized order is in process of construction for one of the mines at Kalgourlie, Australia.

A list of recent orders for traveling cranes received by Pawling & Harnischfeger, of Milwaukee, illustrates the improvements that are going on in plants for making and working up steel. The Midvale Steel Company, of Philadelphia, bought six cranes, and the other purchasers mentioned in the list are as follows: Wheeling Mold & Foundry Co., Wheeling, W. Va.; Hood Machine Com-

pany, Birmingham, Ala.; Mountain Copper Company, Keswick, Shasta county, Cal.; New York Shipbuilding Company, Camden, N. J.; United States Government New Printing Office, Washington, D. C.; E. Hodge & Co., Boston, Mass.; National Steel Casting Company, Montpelier, Ind.; Erie City Iron Works, Erie, Pa.; Vilter Manufacturing Company, Milwaukee, Wis.; Wisconsin Bridge & Iron Company, No. Milwaukee, Wis.; Butte City Water Company, Butte City, Mont.; Waterbury Farrel Foundry & Machine Company, Waterbury, Conn.

BOILERS AND NAVY DEPARTMENT.

In the last number we mentioned the protest made by the Abendroth & Root Manufacturing Company against alleged favoritism in the Navy Department to a certain type of boiler. The department has answered that the charges are serious and has asked for more specific information. In reply the company make some practical recommendations for an improved system of specifications. The matter will be of interest to tool men who are frequently having similar troubles of their own and are occasionally putting in protests, which, however, for some reason have not attained the publicity of this one. The present might be a favorable opportunity to seek reforms in the specifications for power plant and machinery equipment all around. The letter referred to is as follows:

"June 18, 1901.

"Hon. John D. Long, Secretary of the Navy, Washington, D. C.

"Sir: Your letter of the 5th instant, signed by Mr. Hackett, acting secretary, has not been replied to owing to my absence from the city.

"It is true that the allegations referred to are of a serious character—indeed so serious that, like all other such allegations, it is most difficult to offer proof of their truth, and, as stated in my letter of 24th May, they cannot be proven.

"Aside from the allegations referred to, the principal ground taken by us is that the form of specifications issued by the Navy Department does not invite the proper competition, and absolutely bars many reputable manufacturers of water-tube boilers of types other than the Babcock & Wilcox.

"If the Navy Department would issue a specification requiring certain efficiency and economy to be shown, offering a bonus for each per cent. in excess of the requirements, and demanding a forfeiture for each per cent. less than the requirements, the department would then—as in shipbuilding and other classes of work—get the very best possible results. On this ground the question of detail construction could easily and properly be covered by a requirement naming the maximum strength which the boiler and its parts must show on a basis of a reasonable factor of safety. In boiler building, as in all other mechanical work, the design and construction of one type may require metal of certain physical characteristics different from the metal required in others, *e. g.*, if on a certain part of a boiler there are imposed certain strains due to uneven expansion and contraction, then metal of certain physical characteristics is required to resist said strains, whereas if in another type the design is such as to preclude the possibility of such strains, then the necessity of metal with the same physical characteristics is obviated, and so on throughout the details of the boiler.

"A simple requirement covering and naming the factor of safety to be employed in all parts of the boiler based upon the actual strains, either from uneven expansion or pressure, would certainly give the department every possible security, which, together with the efficiency and economy requirements, would cover the ground completely for the department and at the same time give every builder of water-tube boilers in the market a chance to figure.

"In view of the fact that the several officers in your department seem to take a most arbitrary position in the matter, we beg to renew our request that you take such action as may be necessary in bringing such about the end desired—*i. e.*, more competition in the contracts awarded by your department and the issuance of a specification along the lines indicated above. Very respectfully,

"(Signed) L. G. READ,
"President and General Manager."

CHICAGO MACHINERY MARKET.

Some sellers of electrical machinery in this market are practically out of business pending an adjustment of labor troubles at the factories. They are selling only from stock in the meantime. But there is no dearth of machinery and it is said that competition among some of the makers of large units is quite keen. This is due largely to the increased output, the capacities of producing plants running from 10 to 25 per cent. above those of a year ago. The larger output is on the whole very well absorbed, though the business may be irregularly distributed. While some factories are rather eager for orders, others are running night and day and can promise no deliveries unless from stock, under ninety days.

The St. Louis, Iron Mountain & Southern Railroad has closed a contract for an electrical power equipment for shops at Baring Cross, Ark., with the Arnold Electric Power Station Company, Chicago. The generators are to have a capacity of about 500 horse-power and the motors about 300 horse-power. Westinghouse machines will be installed. The contracts will soon be placed for an equipment of electrical power for the Union Pacific shops. Another large railroad installation to be ultimately made is for the Pennsylnia shops at Columbus, Ohio, that road now having the electrical equipment under advisement. It is said that the requirements will be about equal to those of the Lake Shore shops at Collinwood, Ohio, the largest shop electrical power yet placed in the West. Another railroad contract recently closed was for three 150-kilowatt generators and corresponding motors for the Chicago, St. Paul, Minneapolis & Omaha railroad shops at St. Paul.

Inquiries from manufacturing plants are numerous—so numerous that the remark is made by one or two sellers here that they cannot figure on all the business offered them. Other representatives of makers report trade rather quiet.

Those machinery builders, who reach the municipal lighting trade, say there is at present a marked disposition among cities and towns throughout the West, ranging in size from a thousand people to large cities, to install their own equipments. If there are independent or individual lighting plants in operation the tendency is for the municipality to buy them out. A much larger percentage of the trade than formerly goes to the municipal corporations, and even where strong influences are exerted towards the construction of the individual plant they are not strong enough to overcome the penchant of the citizens to control their own lighting plants.

Quotations.

NEW YORK, Monday, June 24.

Pennsylvania Foundry Pig Irons, Jersey City delivery, good brands:

No. 1 X	$15 15 @ 15 75
No. 2 X	14 65 @ 15 15
No. 2 plain	14 15 @ 14 65
Gray forge	13 75 @ 14 50

Alabama Pig, New York delivery:

No. 1 foundry, or soft	15 25 @ 15 50
No. 2 foundry, or soft	14 50 @ 14 75
No. 3 foundry	13 75 @ 14 00
Foundry forge, or No. 4	13 25 @ 13 50

Bar Iron—Base sizes—Refined brands, mill prices on dock, 1.58 @ 1.65c.; from store, 1.80 @ 1.90c.

Tool Steel—Base sizes—Good standard quality, 7c.; extra grades, 10c. and upward.

Machinery Steel—Base sizes—From store, 1.90 @ 2.00c.

Cold Rolled Steel Shafting—Base sizes—From store, 2½ @ 2¾c.

Copper in carload lots—Lake Superior ingot, 17c.; electrolytic, 16⅝c.; casting, 16½ @ 16⅝c.

Pig Tin—28⅜ @ 28½c., for 5 and 10-ton lots, f. o. b.

Lead—For wholesale lots, 4⅜c., with .02½ @ .05c. extra for carloads.

Spelter—3.95 @ 4c., New York.

Antimony—Cookson's, 10¼ @ 10⅜c.; Hallett's and U. S., 8¾c.; Hungarian and Italian, about 8⅝c.

Lard Oil—Prime City in jobbing lots, 70c.

Roller Thrust Bearing.

BY C. R. PRATT.

The half-tone illustrates a roller thrust bearing made with short, straight cylinders, ½ inch diameter by ¼ inch long, and corners rounded 3-32 inch. These cylindrical rollers are arranged in two spirals, the inside rolls rotating in a circle of about 4 inches diameter. This particular bearing has 180 rolls, and revolves 300 revolutions per minute under average loads of 20,000 pounds and maximum loads of 80,000 pounds.

The first one of these bearings was put in a Sprague-Pratt electric elevator in the Manhattan Hotel about four years ago, and after two years' run had shown no measurable wear, no track of the rolls on the plates, and both rolls and plates had acquired a high polish.

Over 100 of these bearings have been put to the same service during the last four years, and, except in one or two instances where the bearing got badly out of line, no injury whatever has happened to them.

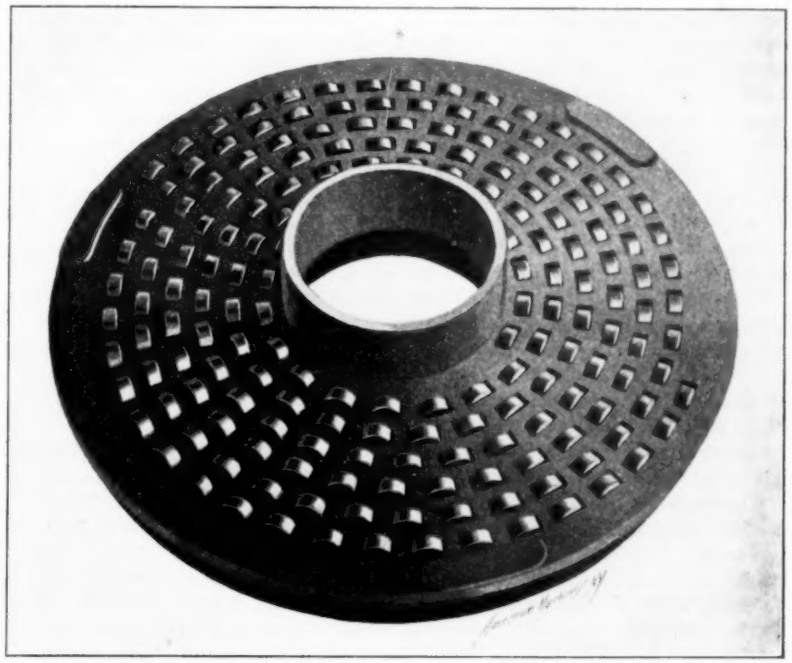
Before trying this form of thrust bearing in the Sprague-Pratt electric elevator, there had been used ball bearings with ⅜, ½, ⅝, ¾ and 1-inch balls, in cages with spiral rows of balls, and in concentric rows between both flat plates and grooved plates, also conical rolls of all forms and angles. The ½-inch balls in spiral rows made the best ball thrust, and averaged to last in fair condition a few months, when both balls and plates were ground to destruction.

No form of conical roll would run a day without grinding out any kind of thrust that could be put behind it, while all combinations of washers and balls have been tried in vain.

It is of course important to keep the thrust in line; use the hardest steel plates, ¾ to 1 inch thick; use the hardest steel rolls; punch all slots with axes true radii; have the rolls a close running fit in the slots; keep well lubricated, submerged in heavy oil if possible. The plates are made of tool steel, pot hardened and ground. The rolls are made of ½-inch drill rod, hardened in cyanide. The cage is made of a bronze casting, slots cored and punched.

We found it necessary to pot harden the plates, notwithstanding they were of tool steel, in order to get the greatest degree of hardness and a perfect uniformity of hardness. I do not pretend to say that tool steel could not be procured and means for hardening it devised that would make it sufficiently hard for the purpose, but we found by experience that pot hardening for tool steel plates was the only perfectly sure way to secure the proper surface for these roller bearings.

[In this brief article Mr. Pratt gives the results and the outcome of several years of experience. It is more than safe to say that he has had more experience than anyone else living in the actual use of ball thrust bearings carrying heavy loads and running at high speeds, and the fact that he has found rollers entirely satisfactory while balls were a failure, is a very significant. It will be recalled (see page 646, issue No. 23) that Professor Gray, in discussing Professor Benjamin's paper on ball thrust bearings at the recent meeting of the American Society of Mechanical Engineers, stated that ⅜-inch steel balls were invariably injured with loads above 40 pounds per ball. Mr. Pratt's roller bearing successfully carries 111 pounds per roller at average load and 444 pounds at maximum load. The rollers are larger than Professor Gray's balls, but the difference in load is out of all proportion to the difference in size.—Ed.]



THE PRATT ROLLER THRUST BEARING.

The Principles of Cost Accounting—II.*

BY F. A. HALSEY.

This looks like a very clear point of division, and it would seem that there ought to be no difficulty in observing it; but there is one item which is usually included in the burden, which it does not cover, and which occupies very debatable ground. I refer to the item of interest on the value of the tools and plant, which is usually added to an allowance for the depreciation due to wear and tear, the sum being treated as a single item called interest and depreciation. Of the correctness of the depreciation charge there is no doubt, but as much cannot be said for the interest charge. I am not prepared to condemn this practice outright, but it is necessary that its questionable nature be shown as well as the fact that those who advocate it have at least a case on their hands to defend, and that, even if their principle is right, their practice is usually wrong. In the first place, this charge as usually made is in flat defiance of the fundamental principle of modern bookkeeping—that is, double-entry bookkeeping. I refer to the principle that every transaction and every charge of whatever nature must appear on the books as a transaction between two individuals—fictitious or real, as the case may be; that is, there must be no charge without a corresponding credit. Now, against this interest charge there is nowhere, on any book, in gross or in detail, directly or impliedly, any credit whatever. It is simply lugged in bodily from nowhere. If the principle is right, there is certainly a screw loose somewhere in its application.

In the second place, the charge, under some not infrequent conditions, is a double charge. This is always true, to a certain extent, when any portion of the capital is borrowed—either through loans at the bank or on bonds. Take an extreme case—though one that is not infrequent in these days of *haute finance*—in which the entire capital is obtained by the sale of bonds, the stock being pure water and representing no outlay nor anything else, except good will, optimism and the control of the business. The interest payments on these bonds will appear in their proper place in the ledger, from which they will be taken in gross and transferred to the sheet on which the gross burden is calculated.

The various tools represent portions of

* A lecture delivered before the mechanical engineering students of Cornell University.

the money thus obtained by the sale of the bonds, and if a special charge for interest is made for the use of each tool, then that charge can only duplicate a portion of what already appears in the interest payments on the bonds.

In the opposite case, in which there are no bonds, payment of dividends is made only out of profits. If no profits are made and no dividends paid, then the charge stands alone as one for which no disbursement has been made. If dividends are paid, then this is the only point of view from which they are regarded as an expense. Moreover, the plant represents but a portion of the invested capital. The stock on hand, both manufactured and unmanufactured, and the business in progress employ capital in precisely the same sense as the plant and equipment. Why should we charge for the use of one portion of this capital and not for the other?

If Mr. Gunn, for whose opinions I have the highest respect, were to discuss this subject before you, he would take a very radical position. In his opinion not only are we not justified in charging interest on the cost of the tools, but if we occupy rented quarters we are not justified in charging the rent as an item of cost, nor would he include the interest on bonds or other loans in the gross burden. In his view, all of these items are of the nature of profit. For this purpose he looks upon the landlord and the bondholder as, in effect, partners who have supplied a portion of the capital necessary to carry on the business. The fact that their legal position is not that of partners does not, in his view, change the essential economic fact that they have supplied a portion of the capital necessary to the conduct of the business and that the money paid them must in the long run come from the earnings of the business.

Of course you will understand that these outlays are not to be overlooked. The argument is essentially the same as the one that I have already drawn regarding selling expenses—that while they must be included in the price to the consumer, they form no part of the cost delivered into the warehouse.

According to Mr. Gunn's schedule, the price paid by the purchaser has at its base the cost of material and direct labor, whose sum forms what some call the prime cost. To this Mr. Gunn adds first the shop burden; second, the business burden, and, third, the profit, the last item including all interest on bonds or loans at the bank, discounts, rent, etc. In other words, according to Mr. Gunn, while these items form a portion of the price charged to the purchaser, they form no portion of the warehouse cost or inventory valuation.

There is one argument in favor of charging the interest on the cost of the tools which has weight, even if in principle the practice be wrong. The placing of the interest charge in the allowance for profit means that it is necessarily added as a flat percentage which ignores the different values of the tools on which the work is done in a manner which has already been discussed. The importance of making the more expensive tools carry their fair proportion of the burden is so great, and so many influences exert themselves against it that it may be fairly argued that to accomplish this, the interest charge should be placed on the tools, but if this is done, cross entries between the ledger accounts should be made in such a manner as to relieve the interest and discount account of the amounts charged against the tools. I am not aware that this has ever been done, but nevertheless the common practice cannot be defended. By no possible argument can a double charge for the same item be justified.

As regards the depreciation item, a word should be said. There are two methods of writing this off—one by deducting each year a fixed percentage of the original cost and the other by deducting each year a percentage from the value of the preceding year. The first plan wipes out the investment entirely after the lapse of a number of years determined by the rate charged off, while by the second plan the values can never become zero. Of the two, the second is the more philosophical. Machinery never does absolutely disappear in value. Even when absolutely worn out, it is still worth the price of scrap and this condition is met by the second plan. Moreover, machinery depreciates in value much more rapidly the first years of its life than it does at a later date, and this condition is met by the second plan. Thus, comparing a rate of 5 per cent. on the first plan with a 10 per cent. on the second, it is clear that at the beginning the second plan would cut down the values at twice the rate of the first, but that when the values reached one-half their original figures, the rate of depreciation would be the same by the two plans and after that the depreciation would be the slower with the higher rate.

As regards the actual rate of depreciation, regard must be had to the nature of the business. In metallurgical work, rolling mills, etc., where the pace of improvement has been very rapid and very revolutionary, it is, I understand, the practice to figure on the entire renewal of the plant every ten years. In machine shops the pace of improvement is likewise very fast, but it is less revolutionary in its character. For example, the turret lathe took first the small screws, studs, etc., from the work of the engine lathe. As time progressed these pieces became larger and the machining of small castings and forgings in large quantities was added to the work of the turret lathe and taken from that of the engine lathe, but the engine lathe did not by that process become antiquated. On the contrary, it still is, as it always has been and bids fair to remain, the leading tool of the shop. Similarly at a later date the automatic turret lathe took some of the work from the hand-operated turret, but the hand-operated turret is nevertheless made to-day in larger numbers than ever before. These examples are characteristic of the nature of progress in the machine shop. It is a rare thing to find machine tools—except occasional ones made for very special and restricted purposes—which have been rendered obsolete by the development of invention. Even the increasing weight of tools does not often retire old light tools, provided they are well made and kept up, because there is always more or less light work on which heavy tools are of slight advantage. It may safely be considered that practically all standard high-grade machine-shop equipment will be retired from service only when it is worn out, and of standard tools made to-day by good makers I consider it entirely safe to figure on a useful life of twenty years and to make the percentage of depreciation such as to reduce them to scrap value at the end of that time.

As regards the frequency with which the burden should be determined the usual period is, I think, one year. Some enthusiastic cost accountants will tell you that it should be done monthly "in order that the manager may keep in close touch with the business." Its determination involves considerable labor—not with the books, for that requires but little time—but labor in inventorying some items, such as fuel, supplies, etc., which must be inventoried in order to balance their ledger accounts. Against the view that advocates frequent determination of the burden, many managers regard the fluctuations from month to month as of no real significance. For example, a large item of expense may come in which is the culmination of a piece of unsuccessful experimenting begun many months before. Calculating the burden monthly involves that such an item shall be included in the burden for the month in which it appears on the ledger and the effect is naturally to greatly increase the burden for that month. Not only does such an increase signify nothing, but it is misleading and incorrect. The large expense item being the outcome of many months' work, should be spread over that period instead of being, as here supposed, concentrated in a single month. At some works under the ablest management, the burden actually in use at any time is the average of that for the previous five years. The burden is calculated anew for each year, the new figure being added at the bottom of a column and the sixth one before it being simultaneously erased and a new average taken.

The actual calculation of the burden is a simple matter. If the books be properly kept there will be ledger accounts with rent, salaries, insurance, taxes, etc., and the balancing of these accounts will give at once the gross sums from those sources

of expense which go to make up the gross burden.

Such items as fuel for the boiler and blacksmith shop and supplies of all kinds must first have an inventory made, and with the value of the amounts on hand, their accounts must be credited before they can be balanced and the consumption for the year determined.

The indirect labor is the most troublesome item of all. The common plan of classifying the workmen as producers and non-producers is very inaccurate. The only correct way is to keep a daily running account with the indirect labor, and this is easily done if properly gone about. Every man about the works whose name appears upon the weekly pay-roll should be required to make out a daily time ticket showing what he has been doing. All tickets which can be charged to any individual piece of work in progress should be so charged, and all which cannot be so charged should be entered upon a sheet by themselves. This sheet may, and should be a duplicate of those used with each piece of work in progress—the indirect labor being treated precisely like a piece of work in progress, except that it is only totaled up at the end of the year, or whenever an inventory is made. In this way the total of indirect labor—always a large one, and larger than anyone suspects who has not thus accurately kept track of it—may be determined and added in with the other items which go to make up the gross burden.

The determination of the gross burden is thus seen to be a matter of straightforward work; but when we come to dividing or apportioning this total among the various pieces of work done, we shall be less satisfied with our results and with ourselves. I have already said that real accuracy in apportioning the burden is impossible, or at any rate impracticable. A moment's consideration will indicate how hopelessly complex our cost accounts would become if the attempt were made to divide each item of the burden according to correct principles. The rent charge should strictly be divided in proportion to the floor space occupied by each tool—the floor space not occupied by tools being left over for treatment on some other basis. The depreciation and insurance on the tools should be divided in proportion to the cost of the tools, and the depreciation taxes and insurance on the buildings in proportion to the floor space occupied, with some left over as before. The power and supplies should be charged in accordance with the amount used by the different tools, and a good part—not less than half—of the power would be left over to be charged on some other basis. Each tool would have to be charged with its own repairs and with the time for which it required the service of the crane; and, again, a portion of the time of the crane during which it is idle would be left over for treatment on some other basis.

Other items of expense, such as the salaries of foremen and the wages paid for indirect labor, have no discoverable relation to the tools. A mere statement of what is involved, if a really accurate division of the burden is to be attempted, is sufficient to show that it is wholly impracticable.

In all these matters we must first ask what can be done and then what is worth doing, and in any event it should be remembered that the result is not so bad as the above statement of what we would like to do but cannot, would indicate. The saving doctrine of averages comes in to preserve the structure. The best system of cost-accounting does violence to many, perhaps most, of the individual items forming the gross burden, and yet, just as a set of observations which are individually erratic may be made to disclose a law which is more accurate than any of the individual observations, so here, while our accounts will result in overcharges for some items of the burden and undercharges for others, still these over and under charges will in a measure compensate one another and give results which are far better than a critical analysis of the system of accounts would indicate. After the worst is said regarding the lack of correctness with which the burden is divided, it must be remembered that the gross cost of a year's product may still be correct, and, indeed, is correct, as obtained by the methods in common use.

There are two methods of dividing the burden in common use, known as the percentage burden plan and the hourly burden plan, and about them and their comparative merits a considerable controversy has been waged—writers arraying themselves on the one side or the other almost with the ardor of partisanship. In view of what has been said, it is hard to understand how anyone can be an enthusiastic supporter of either one, as both can easily be shown to lead to absurd results in extreme cases.

Under the percentage plan the gross burden for a given period is divided by the gross direct wages for the same period. The resulting ratio, treated as a percentage, gives a factor which, when multiplied by the direct wages on any piece of work will give the burden belonging to the work, and this added to the direct wages will give the final labor cost.

The great special shortcoming of this plan is that it ignores the element of time, which is a necessary factor. It is obvious that the burden properly chargeable against a given tool would be twice as much for two hours as for one, and yet were a job done to-day by a two-dollar man and to-morrow by a dollar-a-day boy, the boy using the same tool, but consuming twice the time of the man, the wages would be the same, and hence the burden also. This is clearly wrong, since the boy having used the tool twice as long as the man, the burden charged against him should be twice as great. The percentage plan has the advantage of simplicity, as after the wages are calculated for each time ticket, the element of time is lost sight of, all succeeding records and accounts being in dollars only.

The above described defect of the percentage plan has led many to espouse the hourly plan, and, secure in the knowledge that it overcomes this defect, they have in some cases overlooked the fact that there are some remaining defects which it does not cure nor help, and they have advocated its use with an ardor which the facts scarcely justify.

Under the hourly plan the gross burden for a given period is divided by the total number of hours of direct labor for the period, the quotient being a charge per hour which is to be added to each hour's wages on a given piece of work to obtain the labor cost of the work. Taking the previous illustration again, it is clear that the hourly plan would charge the boy with twice as much burden as the man, as it clearly should.

The chief point which the hourly plan entirely fails to meet is the interest and depreciation charge. Returning to the illustration of the boring mill and centering machine which was used to show the importance of correct burden distribution, it is clear that since the hourly plan makes no distinction between different tools, the charge per hour would be the same for the one machine as for the other. In this respect the hourly plan is in fact inferior to the percentage plan. In the case of the boring mill and centering machine, the operator of the former was assumed to receive $3.00 and the latter 50 cents per day in wages, and the percentage plan would therefore charge six times as much burden against the former as the latter. Such an adjustment would by no means always follow, as small machines often require highly paid workmen. In the finer classes of work, especially, the wages of the operator have no significance in this connection, but in general manufacturing the general tendency of the percentage plan may be worth mentioning. At best it is but a tendency which makes many individual mistakes. The extreme case of this defect, which is equally serious with both plans, arises with bench or erecting labor. Such labor does not employ the power-driven tools, and none of the burden due to those tools should be charged against it, but neither plan makes any distinction of this kind.

You will see that this matter grows in importance as large tools are added to the plant. When the tools are all of moderate cost it may be, and usually is, ignored. With a combined interest and depreciation charge of 10 per cent., the annual charge for these items on a machine costing, say $1,000, is $100; or, assuming 300 working days per year, 33⅓ cents per year, or 3⅓ cents per hour. Few, if any, good shops charge less than 50 cents per hour for any

work done by the hour, and it is apparent that on a machine having an interest and depreciation charge of 3⅓ cents per hour it is of no very great importance whether it is charged with strict accuracy or not. If a shop has no tools exceeding about this figure in value, I should say that the hourly plan would give as satisfactory results as any practicable plan that could be devised, and even had the shop a few large tools it would perhaps be better to use that plan with the addition of some special charge for the large tools rather than incur the complication of more elaborate methods. With machines costing, say $10,000, the matter assumes another phase, since the charge for interest and depreciation becomes 33⅓ cents per hour —more, probably, than the wages of the operator—and with still larger tools the matter becomes still more important, and sooner or later, in a shop fitted with such tools, the subject becomes one which will not down.

When the subject comes to be considered in detail it soon appears that there are other items besides interest and depreciation which should be considered in this connection. The burden may in fact be considered as composed of two burdens—the man burden and the tool burden—since some of the expense is incurred because of the men and some because of the tools. For instance, heating and lighting are needed by the men only, since, as far as the tools are concerned, they could do their work just as well in the cold and dark. On the other hand, the power is consumed by the tools. Some items are not easy to classify or divide. For instance, both men and tools need protection from the weather, and the charges on the building are thus properly chargeable in part to both, though just how the division should be made is not easy to decide. Insurance on the tools themselves is of course chargeable to them only, whereas insurance on the buildings is chargeable to both tools and men. The expense of superintendence and foremanship, except as it relates to the installation of new tools or to repairs, is obviously chargeable to the men.

The first establishment which, so far as my knowledge goes, directed its attention to this view of the matter was William Sellers & Co., of Philadelphia, who originated a method of burden accounting from this point of view more than thirty years ago which, with but slight modification, is still in use in their works. The plan consists of two parts. The first part relates to the division of the total burden into its two parts. This procedure is quite complex, and to go into it would require both time and close application. This, however, is unnecessary, as it is, for the present purpose, of less importance than the method of apportioning the two parts after they are obtained, and, moreover, questions regarding the propriety of the methods used might be raised. The method of apportioning these two burdens among the different pieces of work done is, however, important and, I believe, original with this establishment.

The man burden is charged against the wages by the percentage plan. The tool burden is first divided by the total number of hours worked by the tools, the result being the average charge per tool per hour, which will be too large for the small tools and too small for the large ones.

Now, if this average charge be divided by the average value of the tools, the result will be a new constant, namely, the charge per hour for each dollar of value of the tools, which, to give it a brief name, may be called the dollar hour factor. If this factor be multiplied by the value of any tool, it will give the proper charge per hour for that tool. Of course, in practice, small differences in the values of tools are ignored. The tools are arranged in groups of approximately the same value, and the same hourly charge is made for all tools in a group. As the tools become larger the number in a group grows less, and some of the larger ones are treated individually.

An objection to this system has been raised—that although as figured for a year that has passed it will give results that are correct for that year, it may not do so when applied to work of the succeeding year, but may result in serious error if conditions of activity have changed. This criticism is sound, but it applies to all possible cost systems. The attempt to forecast the future from the results of the past implies constant conditions, if accuracy is to result, not only in cost-accounting, but in all other fields of work. This, in fact, is the main sound reason for frequent calculation of the burden.

(Conclusion.)

A Piston Speed Chart.

BY LAWFORD H. FRY.

In the design or criticism of an engine, either stationary or locomotive, it is often desirable to ascertain the piston speed corresponding to various rotative speeds. The accompanying chart has been designed to give this information for engines having strokes from 10 to 36 inches in length. If the engine under consideration is a stationary engine the speed will be given in turns per minute, while for a locomotive the speed will probably be given in miles per hour. The chart has been constructed so that for an engine with a stroke within the above limits, if the speed in turns per minute or in miles per hour be given (in the latter case the driving-wheel diameter must be known) the piston speed can be determined simply by drawing a straight line and reading off a scale. The term "piston speed" is here used in the generally accepted sense of "mean piston speed"—that is, the length of stroke is divided by the time the piston takes to travel from one end of the cylinder to the other and the result is called the piston speed. No allowance is made for the fact that within the length of the stroke the piston starts from rest, is accelerated to a maximum speed near the center of the stroke, and is again brought to rest. If, for any reason, the maximum piston speed is required it can be found by multiplying the mean piston speed as defined above and as found from the chart by 3.1416 (π).

A further class of problem which the chart is capable of solving is that in which the diameter of a wheel and its linear speed in miles per hour are given and the number of rotations per minute is required.

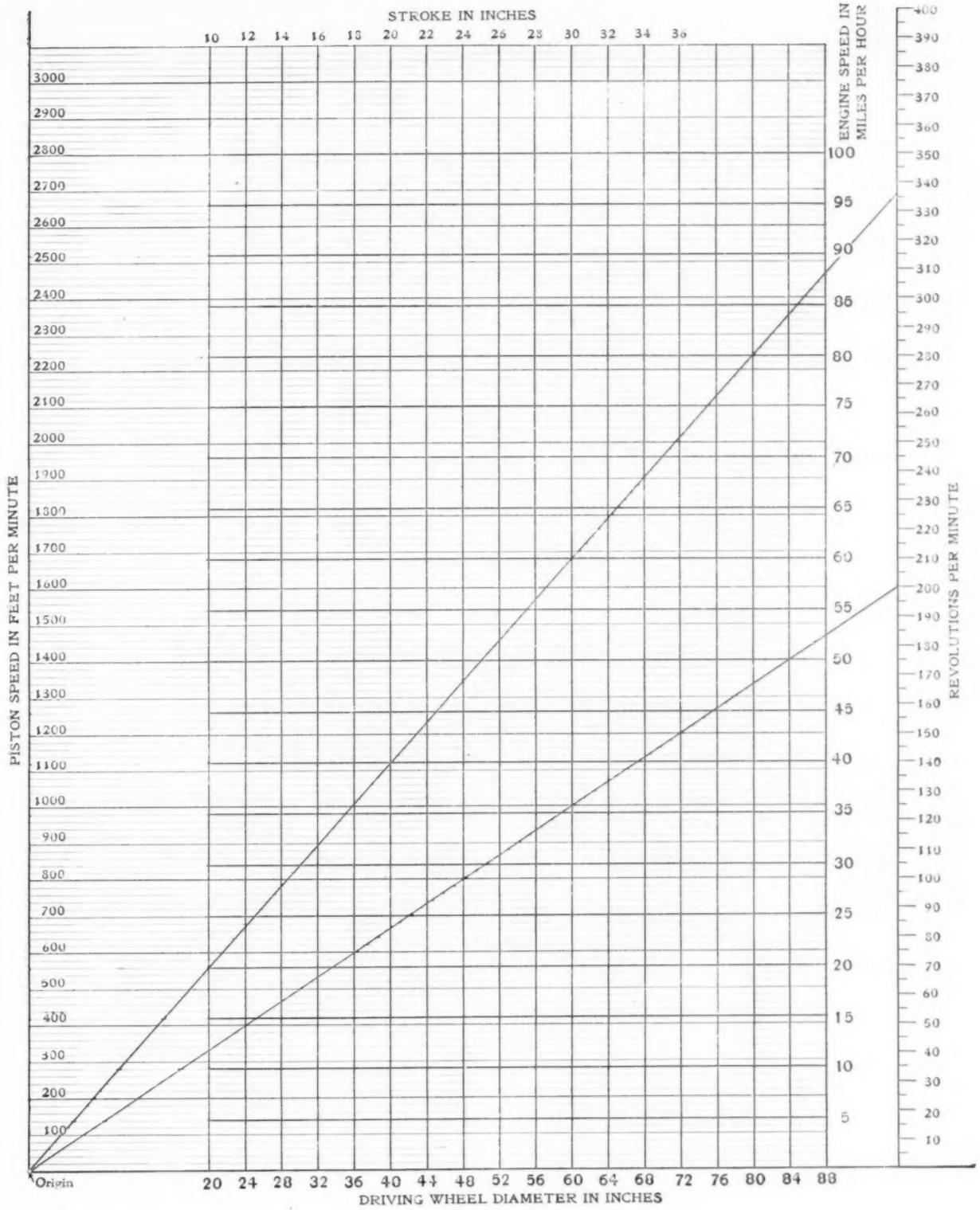
The method of working with the chart is as follows:

I—*To find the piston speed, having given the stroke and the number of revolutions per minute.*

On the right-hand scale marked "Revolutions per Minute" pick out the division corresponding to the given number of turns and lay a straight-edge through this division and the point at the lower left-hand corner marked "origin." Follow the line of the straight-edge to its intersection with the vertical line marked with the length of the stroke, then the horizontal line through this point of intersection gives the piston speed on the scale at the extreme left of the chart. For example, to find the piston speed of an engine with a 26-inch stroke running at 200 turns per minute: The lower diagonal line represents the position of the straight-edge when laid through the origin and the 200 division of the scale for turns per minute. This line intersects the line for 26-inch stroke on a horizontal line which is seen by reference to the piston-speed scale to correspond to a piston speed of 870 feet per minute. Of course the process is reversible, and if the stroke and piston speed are given, a line drawn from the origin through the intersection of the stroke and piston-speed lines will indicate the number of turns per minute on the scale at the left of the chart.

II—*To find the piston speed of a locomotive, having given the stroke, driving wheel diameter and the engine speed in miles per hour.*

From the engine speed scale at the right of the chart, and from the driving wheel diameter scale at the bottom, choose respectively the lines corresponding to the data of the problem. Find the intersection of these lines and through this point and the origin lay a straight-edge. The piston speed is given, as before, by the horizontal line through the intersection of the straight-edge and the vertical stroke line. The upper diagonal line is drawn to illustrate the solution of a problem of this class. For instance, with a driving wheel 60 inches in diameter running at 60 miles per hour, to determine the piston speed when the stroke is 24 inches: Find the



PISTON SPEED CHART.

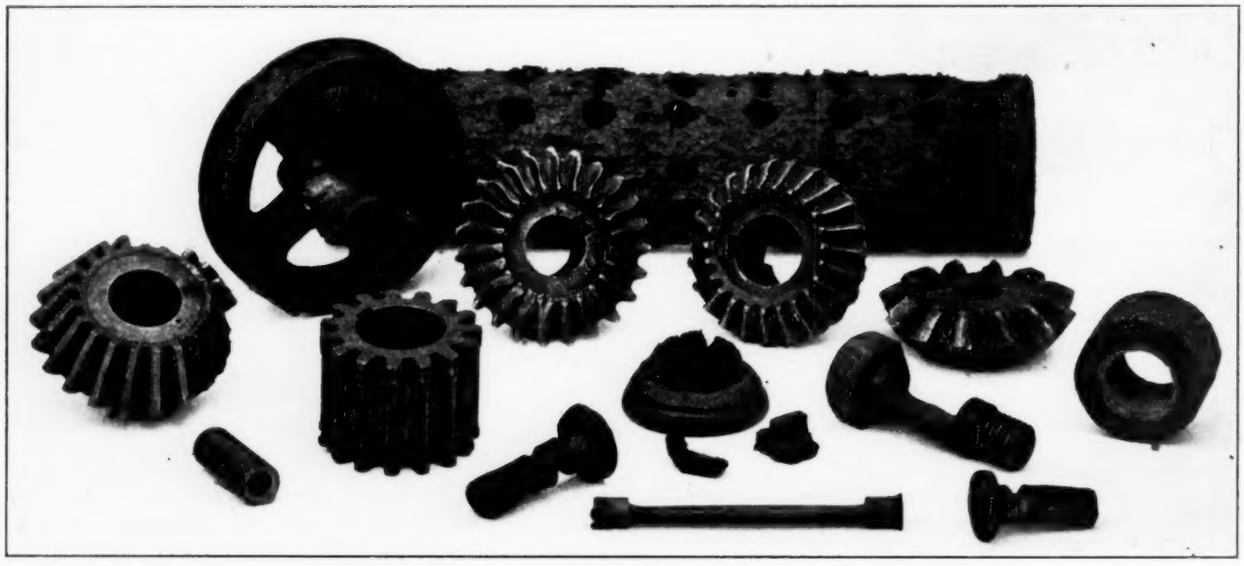
intersection point of the driving wheel diameter line, marked 60, and the speed line for 60 miles per hour; draw a line through this point and the origin. This line cuts the 24-inch stroke line at a horizontal line corresponding to a piston speed of 1,340 feet per minute. As in the first case, the process is reversible, and any three of the four factors being given the chart will give the fourth by a procedure similar to that by which the piston speed is determined. Care must be taken, however, to choose the right intersection as a starting point. One must use the intersection of the piston speed and stroke lines or of the wheel diameter and speed lines. This is indicated on the chart by printing the wheel diameter and engine speed scales in bolder type than the piston speed and stroke scales. Intersecting lines must both be from the heavily printed scales or both from the lighter scales, not one from each. The rule may be easily remembered if it is noted that two of the factors, piston speed and stroke, relate to the piston; while the other two, wheel diameter and speed, relate to the wheel. In choosing the first point of intersection the lines must both relate to the same part, either to piston or to wheel.

III—*To find the number of turns per minute when the driving wheel diameter and speed in miles per hour are known.*

Pick out the lines corresponding to the driving wheel diameter and the speed in miles per hour. Through the origin and the intersection of these lines draw a diagonal line producing it to meet the scale for revolutions per minute. The reading on the scale where the diagonal meets it gives the number of turns. The upper diagonal line drawn in the figure will serve as an example. This line passes through the intersection point of the lines for 50-inch wheel diameter and 50 miles per hour and meets the revolution scale at the division 336, from which we learn that a 50-inch wheel running at 50 miles per hour makes 336 turns per minute.

Mechanical Object Lessons.

The half-tone herewith is one that must be mostly depended upon to tell its own story. It shows a few pieces of a great many that have been collected by the Arthur Company, of this city, in the course of their business. The collection shows how much machinery has to submit to sometimes in the way of abuse or neglect, and how long it often endures and in a way performs its functions before giving out entirely. Most of these things have a pathetic story to tell of the oil that never came. Here is a shieve and the pin that once fitted it; they seem to be scarcely related now. The hub of the shieve has entirely disappeared. Various other pins are shown with more than half of the section cut away. Here are gears with teeth worn or broken in various different styles, a valve which the stem has punched a hole right through, a pipe so corroded that it has all it can do to hold itself together, and a piece of another pipe choked with lime so that the flow of the water was seriously interfered with. When we have in this country, as we have not yet, an adequate and satisfactory engineering and mechanical museum, not the least interesting and instructive among its curiosities would be such samples as those of how not to do it in the care of machinery. These are only a few of the readily portable articles in the collection of The Arthur Company.



VICTIMS OF NEGLECT.

Minuteness of Microscopic Work.

I have frequently found that a misunderstanding exists as to the size of the details of structure revealed by the microscope. Many of these details so much resemble in general appearance the comparatively coarse crystalline structure that can be seen by the aid of very moderate magnifying power, that it is by no means uncommon to find a totally false impression existing as to the order of magnitude of the features revealed by microscopic analysis. To those who have not given special attention to such matters the statement that a certain photograph shows details magnified 200, or 500, or 1,000 times really conveys very little real meaning. For instance, we have on several occasions had exhibited in this hall lantern slides showing the micro-structure of metals, the image on the screen covering a disk of about 10 feet in diameter. Now, by no means uncommon magnification in making such slides is one of 200 diameters, and as the slide is in our case magnified about 40 times by the projecting lantern, the total magnification of the image, as seen on the screen, amounts to $200 \times 40 = 8{,}000$ diameters. But this means that the diameter of the actual surface which we see covering the 10-foot disk is but 1-66 inch, or about three-fourths of the diameter of one of the very small fine pins which are frequently used for attaching cheques or other enclosures to letters. Such a result as this, however, is frequently exceeded; and one very remarkable slide, shown by Professor Ewing on the occasion of his lecture on the "Structure of Metals," delivered at one of our graduates' meetings in January last, had been prepared with a magnification of 4,000 diameters, enlarged on the screen to 160,000 diameters. In this case, therefore, the image covering the 10-foot disk on the screen represented an actual surface of which the diameter would be less than 1-1300 inch, or about 1-26 of the diameter of one of the small pins to which I have just referred. Bearing this fact in mind, a better idea can be obtained of the dimensions of the details of structure shown by the image exhibited. It may further bring home the meaning of such a magnification as this if I mention that if magnified 160,000 times, a "wave" of yellow light would have a length of about 3⅝ inches.—Address of President WILLIAM H. MAW, Institution of Mechanical Engineers.

Ingeniously Consolatory.

American prices are cheap now, because what they are supplying us with is as much an advertisement as are the very fine and costly illustrations in their engineering papers. When they have once turned the market in their own direction, one of two things will happen—prices will rise, or quality will fall. America has been expanding her railway system with enormous rapidity; great workshops have been established to supply the engines, etc., required, and as the home demand tends to be satisfied, a foreign market must be found. There is a double reason for low opening prices—to establish a trade, and to keep shops going. But we much doubt whether, given a slack time in England or even

after the advertising has been pushed as far as it can afford to go, American goods of this kind will hold their own whether in quality or price, against English. We have already heard murmurs as to the quality of their engines, and their bridges will require careful examination for some time.—"Indian Engineering."

An Improved Blanking and Piercing Die, and Two Bending Dies.

The dies shown in this article will serve as practical illustrations of how a rather intricate job in blanking, piercing and bending sheet metal may be accomplished, by the use of dies which are simple and inexpensive to construct and very rapid in production. One in particular, the punch and die for the first operation for blanking and piercing, is in itself of interest, as it shows a new and improved method of piercing and punching the blank, and is far more reliable and durable than the dies in general use for the production of such work—namely, the regular "gang" or "follow" dies, in which the metal is fed along and the holes pierced, and then moved one section and the blank punched out, while in this die the blank is produced complete at one stroke of the press, and each is an exact duplicate of the other, as all possibility of variation in the position of the holes pierced is eliminated by the manner of inserting and fastening all the piercing punches within the blanking die.

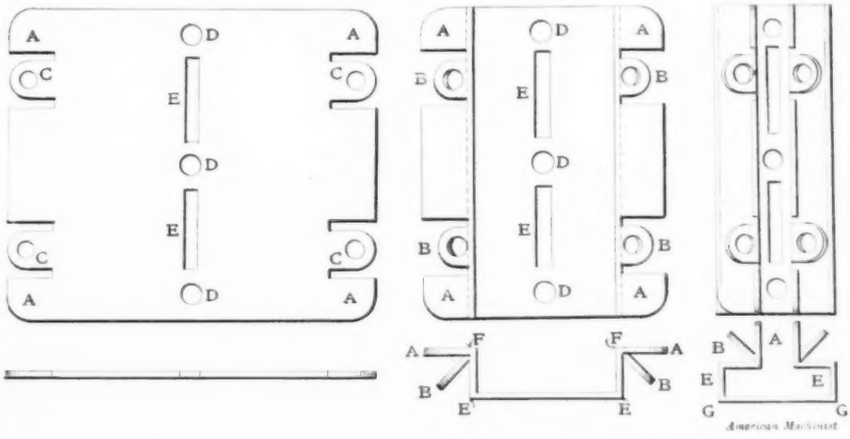


FIG. 1. SHOWING THE BLANK AND THE BENDING OPERATIONS.

As this method of constructing a blanking and piercing die is not generally known (in fact, in all my experience I have only found it in use in one shop) the design and practical points necessary to the successful construction of it are worthy of a detailed description. In the blank, Fig. 1, there are wings at *B B B B*, each having a hole *C* pierced in the position shown. There are also three holes pierced at *D D D* and oblong slots at *E E*. As all of these holes had to be exactly located in relation to each other, a perfect templet, or master blank, was essential. This was made of 1-16 inch flat sheet steel, finishing it to the exact shape and size required—that is, with the corners *A* and the wings B rounded to the proper radius, and with all the holes and slots reamed and finished to size.

We were then ready to make the die, which is shown in the three views of Fig. 3. The dies after being fitted to the dovetailed bolster *P*, with key *R* to hold it, were ground on the face and then drawn to a dark-blue temper. The templet was clamped to the face of the die and an outline of it transferred to the die with a sharp scriber. The corners of the outline were drilled and reamed to the radius required with a straight reamer, as were also the ends of the wings. The stock between these points was then drilled and worked away and the templet carefully worked through the die from the back, by soldering a short, slender brass rod to the center of it. Care was taken to finish the die perfectly straight, no clearance being allowed, so that the templet would fit all the way down. The inside of the die was then finished and polished as smooth as possible, after which the holes for the four stripping pins *D* and the gage pin *A* were drilled. The die was then hardened, heating it to an even cherry red, and when quenching it dipping perfectly straight, thereby avoiding as far as possible the tendency of the steel to crack or warp excessively. The die was immediately warmed to take the chill out, after which the face was ground and then drawn to a dark straw color.

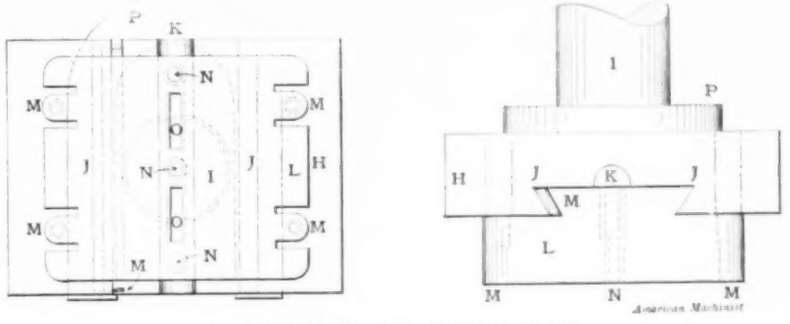


FIG. 2. BLANKING AND PIERCING PUNCH.

The punch is shown at *L* in the two views of Fig. 2. A piece of well-annealed tool steel, after being roughed out and finished in a dovetail at the back, was tinned on the face and the templet sweated on. The punch was then worked out, first in the shaper and then with the file, down to the edges of the templet, leaving a margin of about .003 inch at all points. Then, by using the templet on the face of the punch as a leader, the punch was gradually sheared into and through the die in the press, removing the punch several times and working away the surplus stock curled up by the shearing. The punch was then finished and polished until it fitted nicely within the die. The holes for the piercing dies *M* were transferred through the templet to the face of the punch by using center drills which fitted exactly the holes in the templet. The dies were then drilled through the punch and reamed from the back to the finish size, allowing them to taper about one-half of one degree. The oblong piercing dies *O* in the plan view were drilled and worked to the edges of the templet, the degree of taper allowed being the same as that in the others. The templet was then removed from the face of the punch, which was then ready to be hardened.

This was a difficult thing to accomplish successfully, as the tendency to warp and the possibility of cracking were considerably greater and harder to overcome than with the die, the presence of the piercing dies in the punch being a factor greatly to our disadvantage. All the piercing dies in the punch were filled with fire-clay to within $\frac{1}{4}$ inch of the face. The punch was then carefully heated (in the gas muffler) and quenched in a bucket of water which had been first slightly warmed, and with about 3 inches of oil on the top. The punch came out all right, except for a few tight spots which were lapped down. The use of the oil contributed greatly to the successful hardening of the punch. The heating of the water also helped. The face of the punch was ground, after which it was heated and drawn, tempering the edges to a dark blue by standing it alternately on each side on a hot plate; the rest of the face, which comprised the piercing dies, was left a light straw color.

The die *S*, Fig. 3, was now tightly fastened in the bolster by the key *R*, and against the two Stubs steel set pins *T*. The punch was inserted within the die until its face rested on the bolster. The holes for the seven round piercing punches *X* and *Y* were transferred through the punch, by the use of a center drill, and also the outlines for the oblong piercing dies *Z*. These outlines were then milled out with a "butt" mill, so that two pieces of finished tool steel, about ⅛ inch larger all around than the finish size, could be driven in, holes being drilled completely through the bolster, so that they could be removed when required, as shown by the dotted lines in the cross-section view of the die. These two punches were then reduced and finished by inserting the blanking punch within the die and shearing the two punches *Z* up into the dies *O*. They were then hardened and drawn to a dark blue, and driven tightly into their respective positions. The holes for the round piercing punches in the bolster were then drilled, and enlarged by counter-boring, the seven punches finished, hardened, drawn to a dark blue and driven tightly into the holes. The faces of the piercing punches came within 3-32 inch of the face of the blanking die.

The stripper plate B was worked out to fit freely within the blanking die. Two holes were drilled in the bolster to admit the stripper studs *C*, and were counterbored to admit the springs *E*. The springs, studs and stripper plate were then assembled in the die and bolster, as shown in the cross-sectional view, Fig. 3. The gage pin *A* and the four stripping pins *D* were made and fastened within the die as shown in the plan view, and the die was complete.

The holder for the punch was then made of cast iron and finished, a dovetailed channel being let into the face, to allow the punch *L*, Fig. 3, to be fastened within it by the key *M*. A hole is drilled straight through the holder at *K*, breaking through into the dovetailed channel in the face, to allow an outlet for the central piercings. Holes were also drilled through for the punchings from the dies *X*. The punch and die were now set up in the press, the body of which was tilted backward to an angle of 15 degrees, and the intermediate horseshoe-shaped pad *P* was placed around the stem *I* of the punch-holder *H*, in the position shown in both views of Fig. 2, thus allowing the easy escape of the piercing scrap. The metal to be punched was 1-16 inch flat, cold-rolled stock, and was fed along the face of the die, beneath the four stripping pins *D* and against the gage or stop-pin *A*. The punch descend-

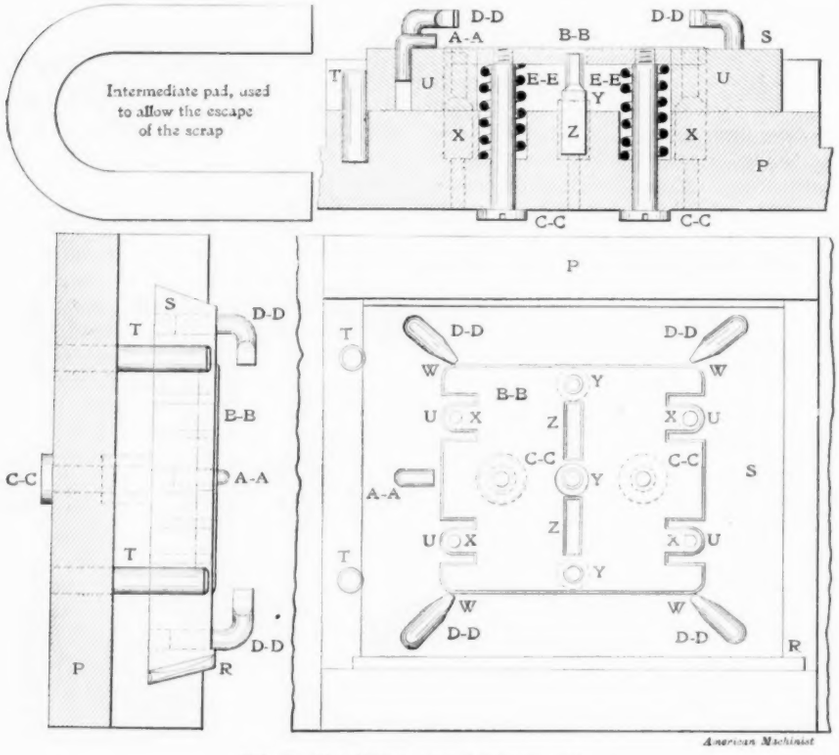


FIG. 3. BLANKING AND PIERCING DIE.

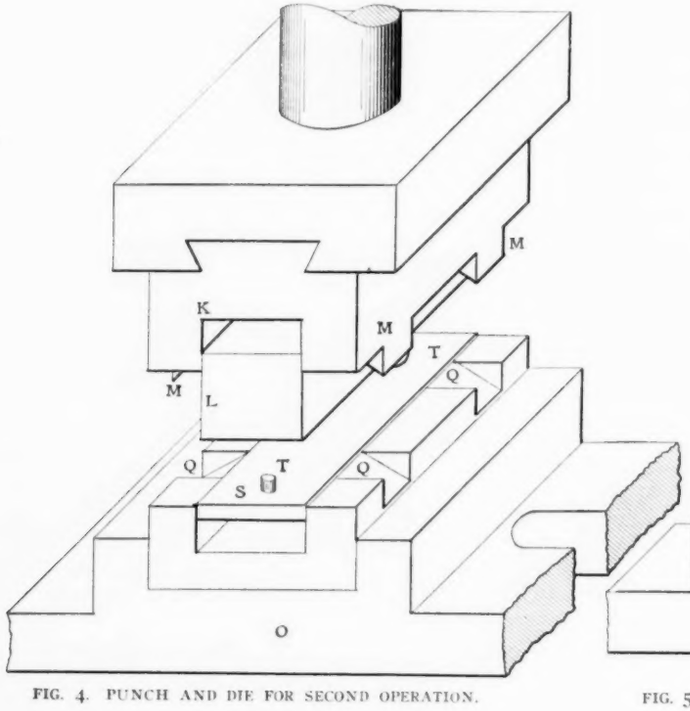


FIG. 4. PUNCH AND DIE FOR SECOND OPERATION.

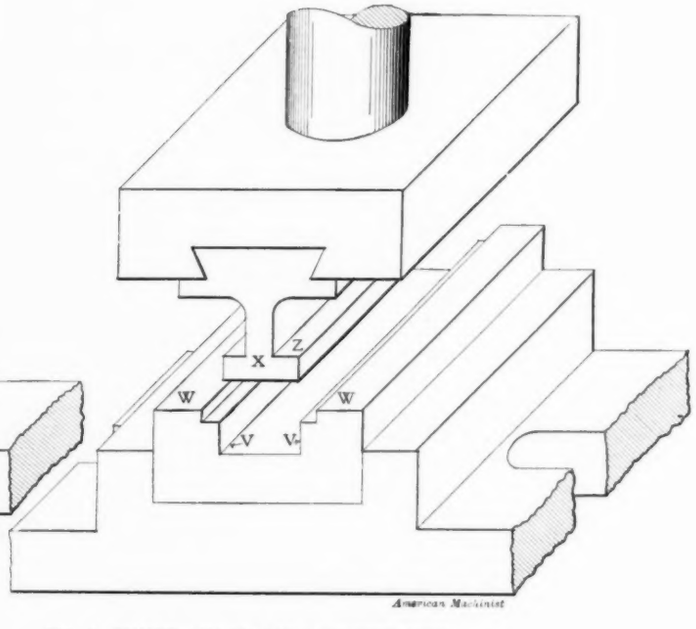


FIG. 5. PUNCH AND DIE FOR LAST OPERATION.

ing, the blank was punched out and held securely between the face of the stripper plate *B* and the blanking punch *L*. All the holes were then pierced, and on the return stroke the metal was stripped from the punch by the four stripping pins *D*, and the finished blank was stripped from the die by the stripper *B*, the blank falling off the face of the die into a box at the back of the press.

The rapidity with which a punch and die of this improved construction can be worked, and the absolute interchangeability of the product, should commend it for all work which is required to be produced in exact duplication and at the minimum of cost.

The dies used for accomplishing the remaining operations, namely, the bending and forming of the blank to the shape shown in the last view of Fig. 1, are clearly shown in Figs. 4 and 5. The design and construction can be clearly seen and intelligently understood without a detailed description. The second operation is the bending of the blank to the shape shown, with the four wings *B* bent to an angle of 45 degrees, with the sides *E* and the top A. The punch and die used are shown in Fig. 4. The blank is placed on the stripping plate *S*, and is located by the two gage pins *T* entering two of the pierced holes *D* in the blank, Fig. 1. Springs within the bolster *O* keep the stripper *S* at the face of the die, and strip the work when bent. The punch *L* for the bend at *E* is also equipped with springs which are strong enough to allow of the punch bending the blank at this point before it bottoms at *K*. *M M M* are the punches for bending the wings, and *Q Q Q* the dies. The appearance of the work after passing through this die is shown in the second view in Fig. 1.

For the last operation the die, Fig. 5, is used, the work being located at *W W*, and as the punch descends it is formed into the die at *V V*, which causes the ends of the work to spring up and "hug" the sides of the punch *X* at *Z*, the result being the shape shown in the last view in Fig. 1. All wearing surfaces of both punch and die used for both operations are draw-filed and smoothly polished, after which they are hardened and drawn slightly, leaving them as hard as possible without danger of cracking. The manner of fastening the punches within the holes by dovetailing them is far preferable and more reliable than by the use of setscrews. The shop in which blanking and piercing dies of the design shown here are in general use, and in which they are demonstrating their superiority over the common "gang" dies, and have almost superseded them entirely, is that of the Incandescent Arc Lamp Company, of New York city, where they are in use for the production of a large variety of different parts and attachments, for electrical appliances.

WILLIAM DORAN.

Characteristics of the American Mechanic.

We take pleasure in reproducing the following letter from the columns of "Engineering," of London. Our readers will recognize at once the facile touch of our own Philosopher of the Oil Country:

To the Editor of "Engineering"—By those who have only a slight acquaintance with the American (Yankee) as seen in the mechanical trades, he is often misjudged. While he no doubt has a certain fondness for money, he does not stand apart from men of other climes in that. His eagerness to acquire it is at least partially offset by that of some other nationalities in their retentive efforts after they once gain possession of it.

It seems to me that there is one trait that is generally overlooked by strangers, and, indeed, not always recognized even here at home. A man will come and speak of some way he wishes to do the work, or some little appliance he would like to have made, or some change in the casting, that certain operations can be shortened or eliminated.

Why does he do this?

Does he expect more pay? He is now getting as much as the shop ever pays.

Does he expect to get a patent on the appliance? He is surrounded on every hand by them, and not a patent in the lot.

Does he expect to shorten his day? He has his full hours to work the same as his fellows, and will have.

Does he expect to be able to take it easy by the change? Not a bit of it, as the reason he gives for the change is increased production or better work.

He isn't working piece work to get the increase.

To think he would do this without any reason would be absurd.

In some ways he is the laziest man in the world. His dislike to doing anything that doesn't accomplish something is intense.

He wants every exertion to result in usefulness in some direction.

To put it in another way, he wants the efficiency of his efforts to be as near 100 as possible. If dollars come from this, well and good; but after all that is not the mainspring.

Put him at work where he has no chance to think and he loses his snap, and you will find that increase of wages will not keep it there.

He will give up an easy job for a harder one for the sake of getting where he can plan and improve, and will forget how hard he is working in his pleasure in doing the work with less exertion than formerly it was done.

Mechanically, he despises his fellow workman who frets, and fumes, and tugs, and strains to do what a little thought and ingenuity would enable him to do in a much better way.

A gentleman who had come in contact with a very competent mechanic for years expressed the opinion that he was the laziest man he had ever known; that he was so lazy, and hated to work so bad, that when there was anything to be done he would think of some little scheme to do it better and quicker than the ordinary way, so as to be able to do it without work, and would hustle around lively, making the scheme do the work as he planned it should.

The opinion is a common one, even with those jobs that are hard work, that some men would be better mechanics if they had less muscle, and so had to think more to be able to do the work.

The joy that an astronomer feels in discovering a comet, that a scientist feels in demonstrating the truth of a new theory, that an explorer feels in laying open the mysteries of a new country, that a chemist feels in producing hitherto impossible compounds; this joy is also felt by the true mechanic when he improves the efficiency of his efforts, and unless recognized in his make-up, he is a puzzle.

That following this feeling generally brings the money, too, is fortunate for the world at large, as they are the largest gainers by it, in material things, and surely no one should blame the Yankee who so arranged that he got as many dollars for as little effort as possible, as that is surely just in line with his usual work of high efficiency. Yours, etc.,

W. OSBORNE.

The Otis Double Power Hydraulic Elevator.

BY WM. BAXTER, JR.

In a hydraulic elevator a cylinder full of water must be used to make a complete trip, regardless of what the load in the car may be, and as the pressure in the supply tank remains constant it follows that the same amount of energy is required for each trip whether the car is loaded or empty. Furthermore this amount of energy must be that necessary to lift the maximum load. If an elevator is designed to lift two thousand pounds at a certain speed, the pressure of the water must be sufficient to perform the task. If the car is empty, the excess of energy can be absorbed by closing the operating valve so as to increase the frictional loss through it, or the valve may be opened wide and the velocity be allowed to increase until the loss of head due to the passage of the water through the pipes at a greater velocity becomes sufficient to reduce the actual pressure acting upon the piston to the amount required to balance the moving load. In actual practice, the operating valve is partially closed, so as to keep the velocity of the car within the prescribed limits.

In places where the load in the car does not vary to any great extent from the maximum capacity, the loss of energy due to the fact that the power consumed per

trip is the same for all loads does not materially affect the working efficiency of the system. On the other hand, it is evident that in any building in which the average load is far below the maximum, a decided saving in energy could be effected by some modification that would make the expenditure per trip proportional to the load lifted. This result can be accomplished in a most complete manner by dispensing with a pressure tank and discharging the water directly from the pump into the hydraulic cylinder, for, under such conditions, the pump pistons will begin to move as soon as the pressure impressed by them upon the water is sufficient to overbalance the resistance of the moving car. This system has been used to some extent, but there are several objections to it, one of which is the unpleasant motion imparted to the car by the pulsations in the pressure due to the uneven movement of the pump pistons. This objection can be overcome to some extent by the aid of large air chambers, or by using some form of rotary pump that delivers a nearly constant stream, but even with such improvements the system cannot be used in cases where first-class service is required.

What is known as the Otis double-power system is an arrangement which serves to reduce to a decided extent the loss of energy in cases where the average loads are far below the maximum. Briefly explained, the system consists in providing two pressure tanks in which the pressures are about as two to one. For light loads, the cylinder draws a supply from the low pressure tank, the high pressure being used only for loads greater than the low pressure can lift. The operating valve gear is so arranged that the passage from one pressure to the other is under the control of the elevator operator and can be effected instantaneously and without a perceptible variation in the smoothness of movement of the car.

The first impression would be that a valve gear that is arranged so as to draw a supply from two tanks charged to widely different pressures would have to be somewhat complicated, but as a matter of fact it is not, and the mechanism itself, as well as the drawing thereof, would not look very different to the casual observer from that used for the simple low-pressure system, which was illustrated in issue No. 18. That such is the case can be realized by a comparison of Fig. 1 presented herewith, with the similar drawing of the low-pressure system given in the above-mentioned article. Fig. 1 is a vertical elevation in section of the double-power valve gear as applied to a vertical cylinder elevator. The essential parts are: A pilot valve which is suspended from the lower end of connecting rod *c;* a differential valve *w* and the main controlling valve *v*. Water from the low-pressure tank enters the

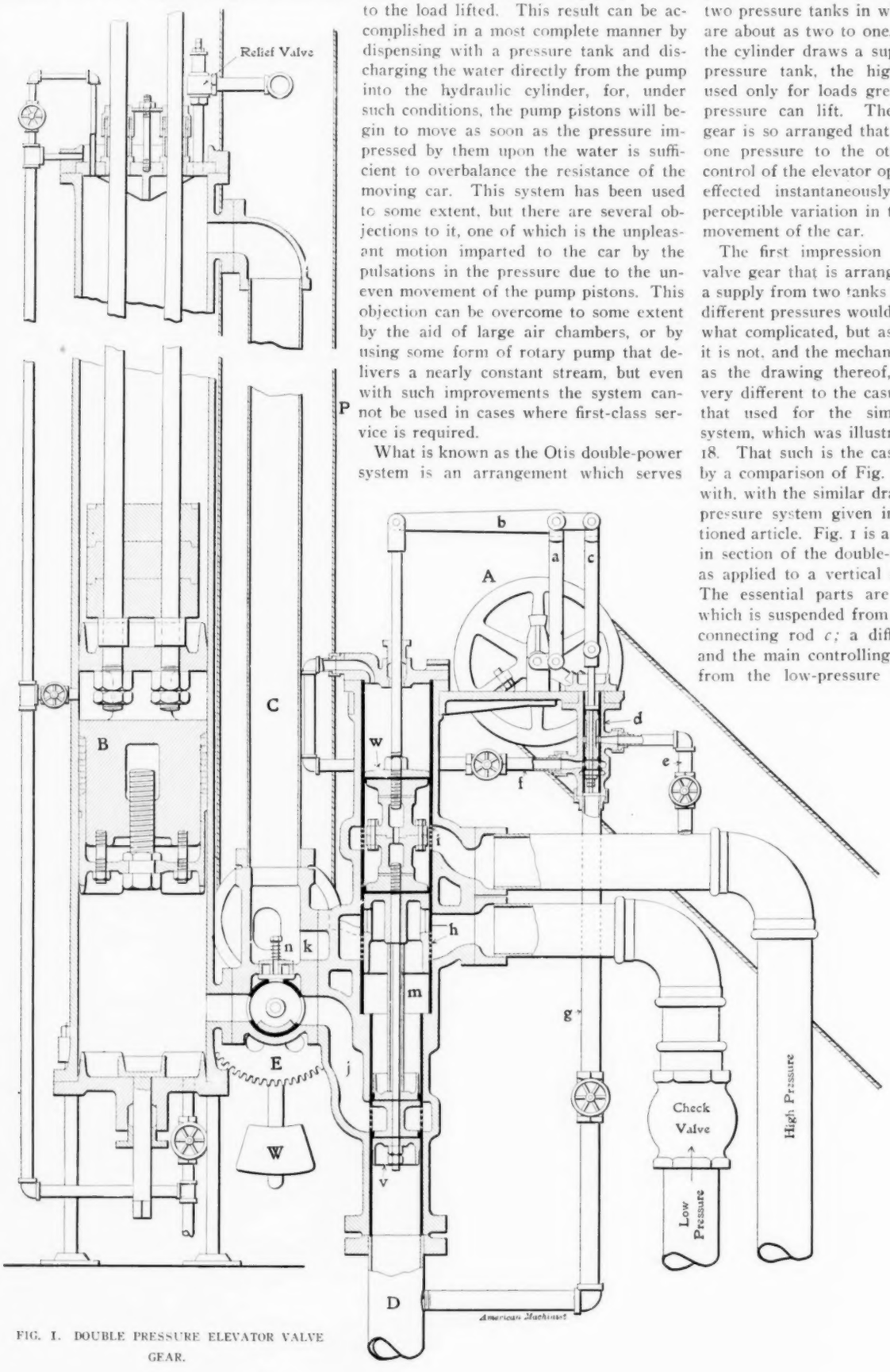


FIG. 1. DOUBLE PRESSURE ELEVATOR VALVE GEAR.

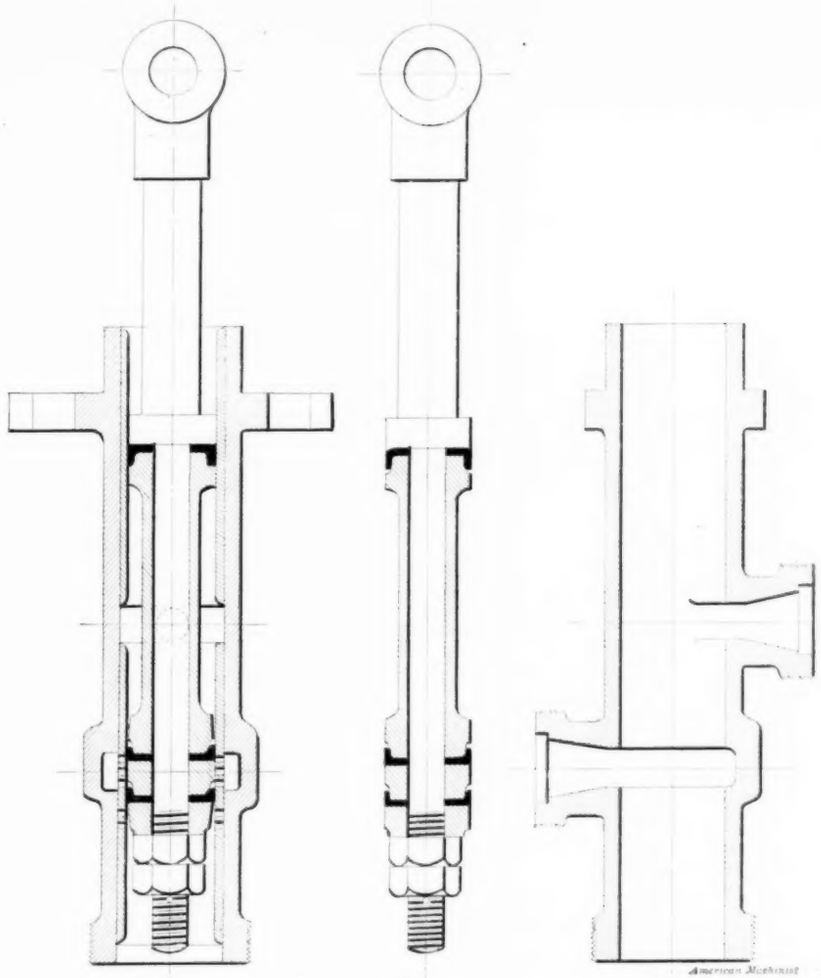


Fig. 2 Fig. 3 Fig. 4

ENLARGED VIEW OF PILOT VALVE.

valve chamber through a large number of holes *h* in the brass lining of the chamber. The high-pressure water enters through a similar set of holes at *i*. The chamber *d* of the pilot valve is connected with the high-pressure pipe by means of pipe *e*, while pipe *f* connects it with the upper end of the valve chamber. At all times the high-pressure water has free access to the central portion of valve *w*, through the openings at *i*. When all the valves are in the position shown, the passage of the low-pressure water is checked at *h*, these holes being covered by the lower extension of valve *w*.

If the operating sheave *A* is turned clockwise by the movement of the hand rope shown leading around it, connecting rod *a* will be drawn downward, and as the friction of *w* will hold the left end of *b* stationary *c* will be depressed. This movement of *c* places the pipe *e* in direct communication with *f*, and thus high-pressure water can pass to the upper side of valve *w*. The high pressure water entering through *i* produces equal upward and downward pressures on *w*, hence, as soon as water enters above the valve the latter will be forced downward and thus the openings in the lower end of *w* will come opposite the holes *h*. As valve *v* moves with *w*, both being secured to the same valve rod, *v* will be lowered and thus the port *j* and chamber *m* will be connected. Some of the holes at *h*, those occupying opposite quadrants of the cylinder, connect with the low-pressure pipe, but the remainder connect with the port *k*, which leads to the upper end of the cylinder, in the same manner as *j* connects with the lower end. With the valves in this lower position, it will be observed that the two ends of the cylinder and the low-pressure pipe are connected. The force exerted by the weight of the elevator car acts to draw the piston *B* upward and thus expel the water from the upper side of the cylinder. This water cannot pass through *h* to the low-pressure tank, being restrained by the pressure, as well as by the check valve shown; therefore it passes through *j* to the lower end of the cylinder.

The action described in the foregoing takes place during the downward trip of the elevator car. To cause the car to move upward the sheave *A* is rotated counterclockwise by the hand rope and then connecting rod *c* moves upward, carrying the pilot valve with it. The upward movement of this valve opens communication between pipes *f* and *g* and thus the water on the upper side of valve *w* can escape into the discharge pipe *D*. The lower end of *w* is not a perfect fit in the chamber *m*, hence the pressure from the low-pressure tank acts in this chamber and is exerted against the under side of *w* and the upper side of *v*. The former being of larger diameter, it is forced upward by the pressure, and thus the holes *h* become uncovered by the passage of the lower end of valve *w* above them. This same movement carries *v* upward, so as to open communication between the lower end of the cylinder and the discharge pipe *D*. The water that enters chamber *m* from the low-pressure pipe through the holes *h* cannot pass through *v* to port *j*, but can enter port *k*, and thus pass to the upper end of the cylinder and force piston *B* downward.

It will be noticed that while the left end of *b* acts as a fulcrum when sheave *A* is turned and thus causes the pilot valve to move, as soon as the movement of *A* stops and *w* begins to move, rod *a* acts a fulcrum, and then the movement of *w* acts to return the pilot valve to the stop position. From this action it will be seen that if *A* is rotated through a small angle *w* will have to move through a correspondingly small distance to restore the pilot valve to the stop position, while a large movement of *A* will produce a corresponding movement of *w*. The first part of the movement of *w* opens the communication with the low-pressure pipe, and the last part of its movement brings the ports in the lower end opposite the holes *i* and thus opens the inlet from the high-pressure pipe. The water from the latter source is prevented from running back into the low-pressure tank by the check valve shown in the pipe.

By analyzing the action of this valve gear, it will be seen that if the sheave *A* is moved any angular distance up to a certain point, it will affect the low-pressure supply only, varying the opening of the valve from zero up to the full capacity. Angular movement of *A* beyond this point will open the high-pressure inlet, the amount of opening of the latter being dependent on the distance through which *A* is moved. It will also be seen that the transition from low to high pressure will not be attended with a violent disturbance of the movement of piston *B*, because the sudden admission of water under a much higher pressure to a cylinder already full of water at a lower pressure will not result in an instantaneous increase from one pressure to the other.

In the article describing the low pressure system it was shown that by means of the relief valve *n* a sudden stoppage of the car is prevented on the upward trip, while the same result is accomplished on

the down trip because the water can leak past the throttle valve and thus pass back into the pressure tank. In the double power system the valve *n* will be forced open if the main valve is closed too rapidly, and thus the downward movement of B will not be instantly checked. To prevent a sudden stop on the upward movement of the piston *B* or downward trip of the car, a relief valve is provided at the top of the cylinder, as shown; for in this case the fit of the lower end of valve *w* is too close to permit the passage of water through it in sufficient amount to prevent an abrupt stop of the piston.

The automatic stop for the top and bottom limits of the car travel is effected by means of the rope *P*, which rotates a sheave mounted on a shaft that carries a pinion that meshes into the gear *E*, this part of the mechanism being the same as for the low-pressure system.

The pilot valve and chamber are shown to larger scale in Figs. 2 to 4. The first one of these illustrations shows the chamber with the valve in the stop position. Fig. 3 shows the valve by itself, and Fig. 4 shows the valve chamber at right angles to the view, Fig. 2, and divested of the brass linings.

The pilot valve of the low-pressure system is made solid, and is simply a good metallic fit. In the double power system, as the pressure to which the valve is subjected is greater, cup packings are used, and on this account the inner brass lining is perforated with a sufficient number of holes to give the requisite opening. The stroke of the valve is also greater than for the low-pressure system, as is also the stroke of the main and differential valves.

The difference in pressure between the two tanks from which the cylinder is supplied is generally made 2 to 1, but, as can be readily seen, the ratio can be made more or less if desired. The two tanks are charged by means of independent pumps. A person not giving the subject much thought might suggest that one pump could do the work by simply charging the low-pressure tank from the high-pressure one, but this would defeat the object of the system, for then all the water would be pumped at the higher pressure.

Letters from Practical Men

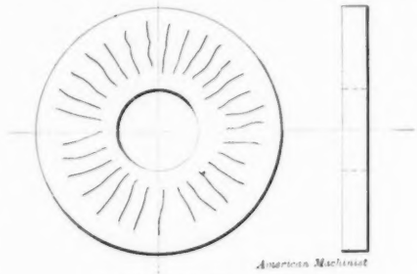
An Experience in Grinding Flat Disks.

Editor American Machinist:

In grinding the hardened tool-steel thrust collars, shown in the sketch, in lots of from 50 to 200, to a thickness approximating .1875 inch and with a limit of error of .00025 inch of parallelism it seemed an easy and desirable thing to transfer the job from the small tool grinder where they had been done to the universal. Much to our surprise we found them leaving the universal with cracks extending radially as shown, though the most severe tests failed to reveal any defects before grinding.

Replacing the job on the small grinder again gave good results. Finally we came to the conclusion that the heat was generated too rapidly at point of contact of wheel and work to be carried away by the water, or by diffusion through the piece itself, before causing the cracks by violently and instantaneously distorting the metal immediately surrounding the moving point, though no heat could be felt when handling them. The small grinder left them so hot they could not be handled until quenched.

After having tried light cuts, heavy cuts, fast and slow feeds, with water and without, narrow and wide cutting edges, we struck the combination of slow wheel speed (about 4,200 feet), No. 60 soft wheel (P.), a very fast feed, cutting edge half-inch wide and running water, which worked very nicely. Finishing wheel was No. 80 and removed from .00025 to .0005.



CRACKS DUE TO GRINDING.

The fact that the two grinders were of different character was also a factor, as the universal, being more substantially built with correspondingly heavier fittings, gave a more constant friction of the wheel upon the work, causing more rapid heating. All wheels were of carborundum.

A. B. CHRISTMAN.

Unprofitable Correspondence.

Editor American Machinist:

Of course I have never published a book about windmills, and of course the following letter was not written in Chicago, but otherwise what I give of it is verbatim as I received it, and the original is still in my possession:

CHICAGO, 4, 11, 44.

Mr. Tecumseh Swift,
Care "American Machinist,"
New York City.

Dear Sir—I have had the pleasure of reading your work on windmills, and to say that I have enjoyed it would be stating it very tamely. The subject is one of great interest to me, as a friend of mine has invented and applied for a patent on a windmill adapted to all conditions and for all purposes. We have read about all the books and papers of which we have knowledge on the subject of windmills, and have concluded after reading your work that if there is one man in the whole country who is master of the subject, you are that individual, and that is why I write you to-day. I enclose a blueprint and statement showing his claims, and earnestly request that you inform us whether or not his claims have merit. I don't think I should presume to attempt to offer any explanation of his claims to one who is so well up on the subject as you, as you will no doubt see the merits or demerits of his claims almost instantly. If his claims are correct he desires to interest someone with him in the promotion of his system, and as you handle the subject in such an intelligent manner, I am sure your opinion on this will either remove all doubts as to its value, or your explanation will show that my friend is on the wrong track. Will you please advise me what you think of it? If you will do this we will remember you in a substantial manner from the first returns. We would be greatly pleased if you will give us an opinion in detail.

Very truly,

C. U. LATER.

Now, this is only one of a considerable number of letters of the same general character that I have received. They have not all slopped on the soft soap quite so profusely, but they have all wanted something for nothing. I have had reason to believe that they usually have not wanted what they purported to ask for. They have not wanted my honest opinion, but rather some expression which could be construed into an endorsement and recommendation of their schemes, and which could be circulated as such. I judge so, because I have wasted quite a lot of time, stationery, and often postage, in answering those letters, and when my reply has been unfavorable I have never received anything further except occasionally an impudent retraction of the flattery previously volunteered. To the above letter I sent the following reply, and I like it so well that I am thinking of using it regularly for similar cases:

C. U. Later, Esq.,
Chicago.

Dear Sir—Replying to your favor of recent date, I thank you for your kind expressions of appreciation of my book. I have looked over the blueprints and description you send me of your friend's invention. It of course would not be proper for me to waste my time and yours by writing a worthless opinion, and it also would not be proper for me to write for a stranger for nothing an opinion which, upon your assumption and statement, would presumably be of some value. On receipt of ten dollars I will send you a candid and, as far as I am concerned, a decisive opinion of the practicability and value of your friend's invention.

Yours truly,

TECUMSEH SWIFT.

Of course I never heard from it again.

I wonder how it would have been if I had made it ten cents instead of ten dollars. How much would anyone get out of a lawyer for ten dollars, and why should a mechanical engineer be cheaper? I know that many fellows in mechanical and engineering lines are continually receiving letters and personal requests similar to what I have received, and I don't suppose any of them enjoy it any more than I do. The fact that there are so many impositions of this kind rather reflects upon the status or stamina of the persons whom it is sought to use. If there were not frequent compliance the attempts would become infrequent. My reply in the above case is commended to the attention of those who may have occasion to use something of the sort, and if they can improve upon it I will be glad to receive their suggestions.

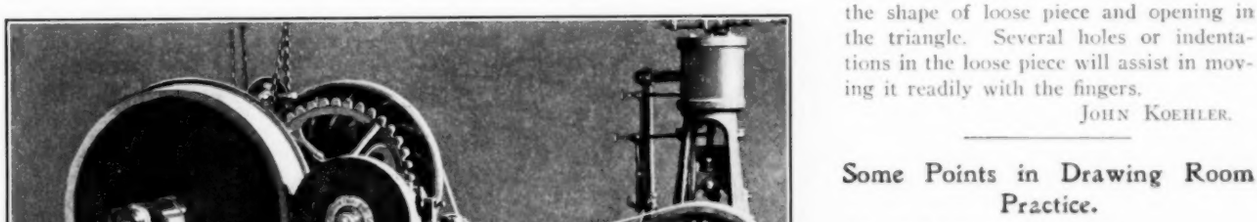
I am not unmindful of how important a factor is correspondence in the carrying on of modern business, and I would be among the last to say a word against whatever is legitimate and which duly recognizes the rights and obligations of both sides. Common sense and self-appreciation are all that are required to adjust the matter. In the meantime I must continue to use my own judgment as to the value of "thanks in advance" and the obligation carried by a postage stamp enclosed. There are many letters the mere opening and reading of which are not paid for by the stamp, so that no obligation survives. TECUMSEH SWIFT.

Finding the Best Cutting Speed for an Emery Wheel.

Editor American Machinist:

There has recently been some discussion in your columns about the best cutting speeds for emery wheels, and as I have lately had some experience in the grinding line, I will give the results for the benefit of others.

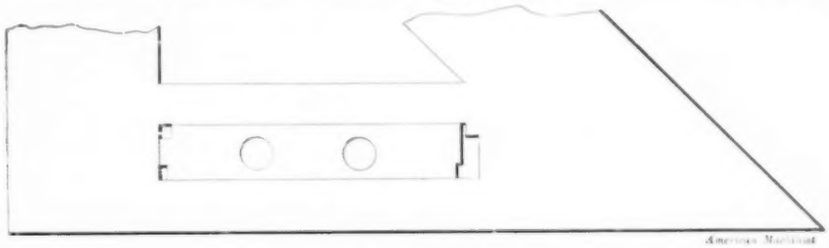
Some years ago I designed and constructed a steam motor for shifting freight cars around tracks on private premises. It was a plain box car, containing boiler, engine and tank, and mounted on two pairs of common car wheels. To the axle of one pair a sprocket wheel was attached driven by another sprocket and chain from the crank-shaft of the engine. This handled two or three cars very well, but it was often desirable to move six or seven, and so I decided to put a sprocket on the other axle also. It was then of course necessary to have all of the wheels the same size, while there was a difference of 7-16 inch between the largest and the smallest. The treads of the wheels were chilled and could not be turned, and so I arranged things as shown.



TEMPORARY RIG FOR SIZING CAR WHEELS.

The wheels were mounted in a pair of old winch stands, and the emery wheel in a frame intended for some wood-working appliance, the whole driven by a small engine temporarily set for the purpose. In ordering a grinding wheel I told the makers what it was to be used for, and left the rest to them. They sent a wheel, 16x 2½ inches, 1,600 revolutions, and I began operating at that speed, rotating the car wheels 1 to 1,200; but I soon found the emery wheel getting the worst of the abrasion business. I then slowed the feed to 1 revolution to 1,800, and the emery wheel became glazed in a very short time. I then speeded up the emery wheel to 2,000 and slowed the feed to three-fourths of one revolution per minute. This proved a good cutting speed, and the wheel did not glaze, but the surface of the car wheel would become blue, and the whole tread so hot that the shape would be distorted, as shown when starting up again after the iron had cooled. I reasoned that the feed was too slow, letting the metal get hot under the wheel before getting out of the way. I then made the rotation 1¼ to 2,000, and everything was all right. It was simply a hunt for the right ratio. The job required the taking off of 50 pounds of metal, and required about forty hours of grinding, yet the emery wheel was reduced but 5/8 inch in diameter. The rotation of the axles and the feeding of the emery wheel were by methods not shown in the photograph.

PETER H. BULLOCK.



ANOTHER SECTION LINER.

Another Section Liner.

Editor American Machinist:

I read with considerable interest I. M. Prove's description of a section liner in your issue No. 17 because about a year ago I constructed one like it with the exception of the following point:

In place of having a different piece to fit in opening of triangle for each width of sectioning, one piece with notches of different depths at the corners will answer for four widths of sectioning, thereby doing away with a number of unnecessary pieces. The enclosed sketch will show the shape of loose piece and opening in the triangle. Several holes or indentations in the loose piece will assist in moving it readily with the fingers.

JOHN KOEHLER.

Some Points in Drawing Room Practice.

Editor American Machinist:

I notice in your issue No. 17 an article by I. M. Prove, in which he brings up that abused subject of section liners and offset shade centers. I believe I can tell him how to "improve" on both of his methods.

I send a sketch of how I would make a cheap section liner and one that will not necessitate cutting his triangle, which is not as easy as it might seem. I speak knowingly here, for I must plead guilty to the charge of possessing a 45-degree triangle that bears evidence of such an onslaught as he suggests (my first attempt at making a section liner).

The sketch shows a loose block *A*, which is simply a thin piece of wood a trifle thicker than the triangle and made

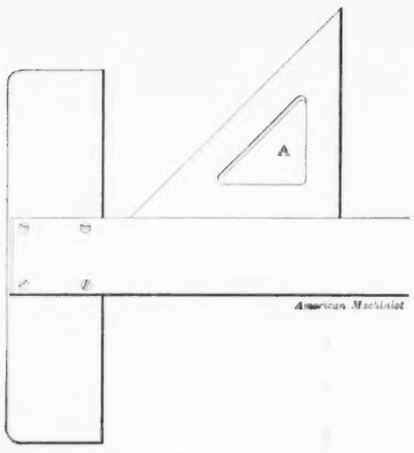


FIG. 1. A SIMPLE SECTION LINER.

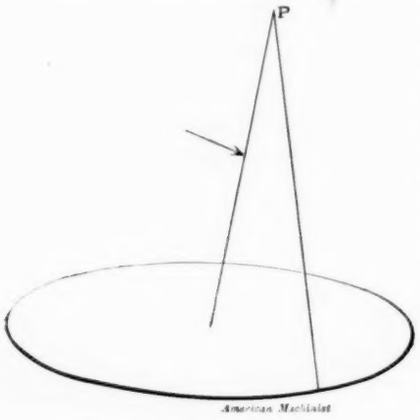


FIG. 2. SHADING CIRCLES.

to conform to the opening in the triangle, but with some lost motion. In fact, I have several of these blocks with varying amounts of lost motion, and numbered so that I can pick up the one which suits the width of spaces wanted.

Offsetting the centers is generally the first method that suggests itself to the beginner as a means of shading circles, and as usually applied produces a rough job at the points of disappearance of the shadows on account of the necessity of putting the pen down and taking it up at just the right point. Then again it may become a source of error if it should become necessary to scale the drawing later, as then the two centers are likely to confuse the draftsman.

A better way, and one that the diagrammatic sketch may help to explain, is that of holding the compasses firmly at the pivot *P* and then, with a finger resting on the needle leg of the compasses, place the pen in contact with the paper and begin to swing. As the pen passes the vanishing point of the shadow begin to exert a slight pressure at the point and in the direction of the arrow, gradually increasing it up to the point of greatest shadow and then gradually diminishing it again to nothing as the opposite vanishing point is reached. The effect is simply that of springing the needle leg of the compasses, which resumes its normal position as soon as the pressure is removed. This method gives a very smooth fading of the shadows, but should be applied before the setting of the compasses has been changed from that used to draw the circle.

A few trials will convince any unbeliever as to the neatness and despatch of this method, and also to the fact that it does not wear out the centers, even when a number of concentric circles are shaded.

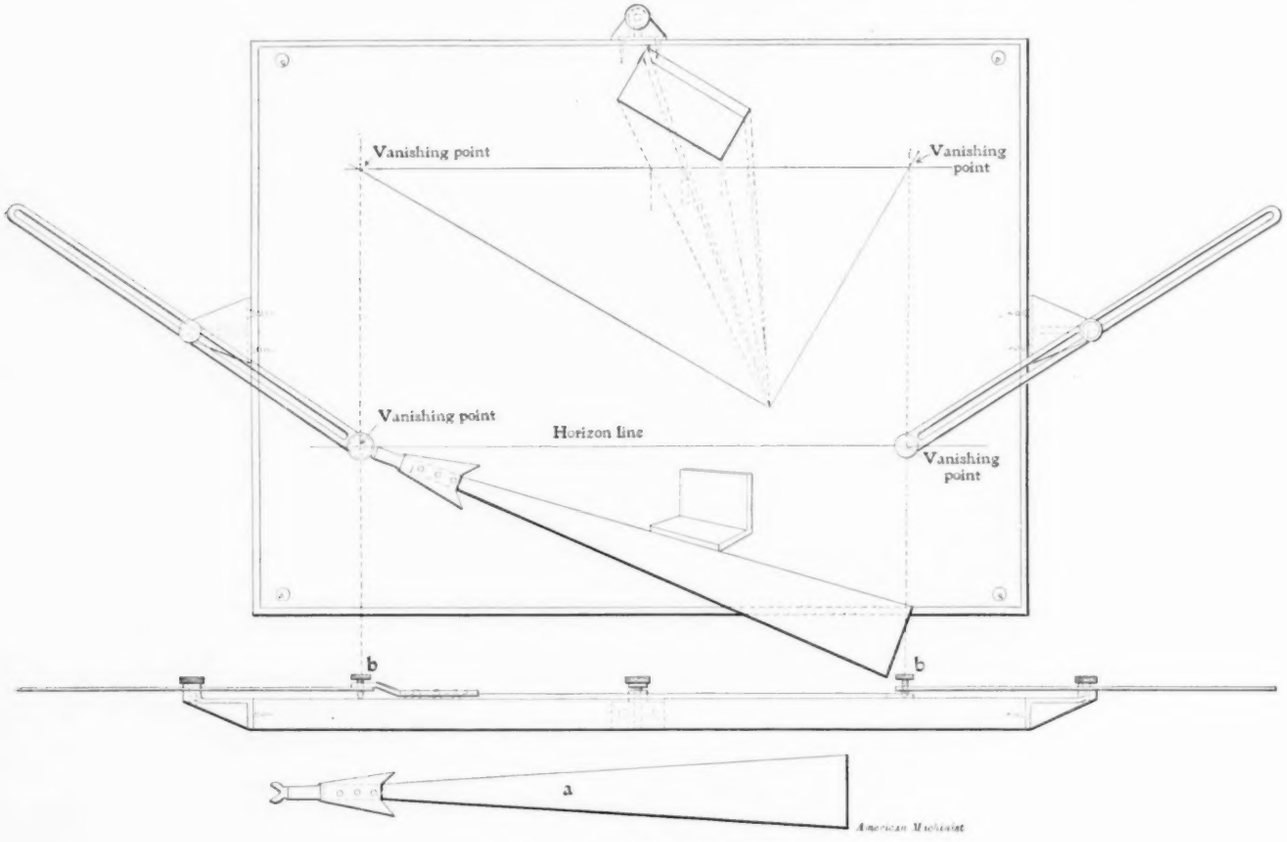
G. F. D.

[A little practice is necessary to acquire the skill necessary to shade circles in the way described above, but, once acquired, no draftsman will ever follow any other plan. What is the use of section liners anyway?—Ed.]

A Perspective Drawing Board.

Editor American Machinist:

I send you herewith blueprint of special drawing board designed for perspective drawing. I have drawn in perspective an angle iron from a plan at the top of the paper. By means of screws *b b* in slotted pieces located directly over the vanishing points and the use of the tapering rule which may be placed against the screws by means of V-piece riveted on the blade it can be used as a swivel and the lines will all radiate from the vanishing points. The blade can be used either on right or left side and lines be drawn to both vanishing points. The slotted strips can be placed in most any point to locate the vanishing points off or on the table, as the case may require, but a longer blade would be required if the vanishing points were off the board. After the vanishing points are es-



A PERSPECTIVE DRAWING BOARD.

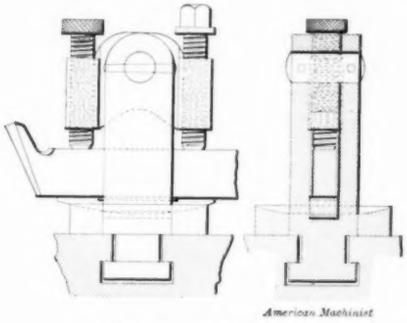
tablished the screws can be unscrewed enough to allow the blade to swing under them. A bracket for supporting the slotted piece is attached to the back side of the board for use in drawing struts or for similar work. C. W. PUTNAM.

Holyoke, Mass.

Another Tool Post.

Editor American Machinist:

Referring to the lathe tool post on page 580, it seems to me that it is not much of an improvement over the one now in



A TOOL POST SUGGESTION.

use, and I doubt if there will be any for some time that will force it out of the market. The balls in the one referred to would be liable to break and cause much inconvenience. I send a sketch of one, of my own design, that is a good one and different from any that I have seen. You can see at a glance how it works.

C. W. PUTNAM.

Pattern Making that Makes Work for the Molder.

Editor American Machinist:

As errors are often instructive, the writer (a patternmaker) wishes to share an experience which ought to be of interest to either patternmaker or molder. Not long since I had the privilege of working in a foundry for the sake of the experience. I will try to describe one of the jobs, which illustrates some of the knacks molders have, as well as showing up a weakness in the patternmaker from lack of foundry experience.

One casting was wanted as per sketch herewith. The cross hatching represents core prints. The first thing to attract my attention was the print *A*, Fig. 2. I suppose it was intended to have it locate the core, which was unnecessary in this case, as the other prints should have been sufficient to locate it. The print was fastened on, so it was necessary to find sticks of the thickness of this print, to put under the flask to make a flat joint which would be desirable. The core was made all in one box, so the patternmaker had to make loose pieces to fit the taper on the print. There was, then, the time consumed in the pattern-shop making the print and the loose pieces, and the time in the foundry hunting up sticks, with no other effect than keeping down the dividends and furnishing material for this article.

The second point about the pattern was that the prints *B C D* were too short to insure a good seat without crushing at the lower edge where the heavy black lines indicate thin pieces of iron rammed up in mold for the core to rest on. If these prints had been twice as thick as they were there would have been no danger without the iron strips. The third point was that the print and box were made exactly the same size at *F* and *G*, which made it necessary to shave the mold so that the core would not scrape and cause loosened sand to fall to the bottom, only to rise again and form holes in the top of the casting. The core should have been made to size, with the prints an eighth of an inch wider to allow for clearance, or else tapered to the dotted lines, with the box made to match. The fourth point was print *E*, which would not have caused any trouble if it had been tapered. As it was, the mold had to be shaved so that the core would clear. In setting the core that part would be out of sight, making it impossible to set it without scraping. This print was as superfluous as the cope print, as will be seen with a little study. With these corrections we have reduced the labor in pattern-shop and foundry, and also insured a better casting. This concludes actual experiments.

Let us consider making this pattern like Fig. 3, to cast the other side down in green sand. It is made this side down so as to have as little as possible to draw in the cope. The flange pieces are left loose, wired on. Using a three-parted flask, the joints would be as shown. After the mold was all rammed up the operations would be in this order: Lift off cope, draw pattern, lift off cheek, take out loose pieces, finish mold and put together. Another way would be to use the same pattern and do away with the cheek, making a two-parted job by using covering cores as shown at *H*, the operations then being as follows: Place cope side of pattern on mold board, ram nowel up to top of pattern as it lies, strike a joint for the covering cores, draw loose pieces, set covering cores, finish ramming nowel, vent, roll, make joint, ram cope, vent, lift cope, draw pattern and finish mold.

Another way would be to use a core plate as shown. After the mold was all rammed the operations would be as follows: Lift cope, draw pattern, lift core, pick in loose pieces and finish mold. It will be noticed in the last three methods that the loose pieces have caused the most trouble, as in each case we have employed some way of separating the mold in order to get out the loose pieces. As the flange overhangs too much to be picked in, we could make two sections, as shown at *I*, each section being thin enough to be drawn. I have seen jobs similar to this made with the flange pieces fastened on, with the draft on the outside the opposite way from that shown. The cheek is drawn before the pattern. The mold would be injured more and take more time for finishing. In making this casting probably

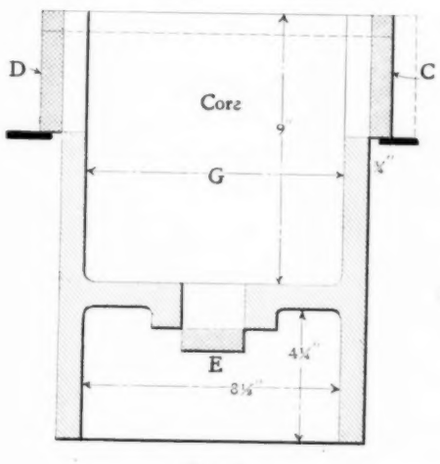


Fig. 1

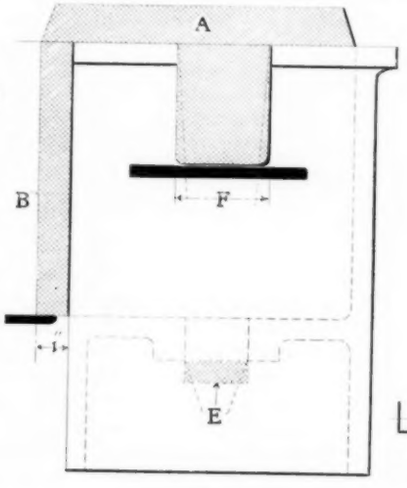


Fig. 2

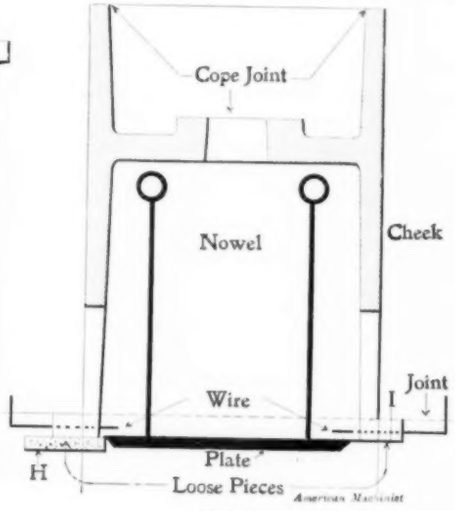


Fig. 3

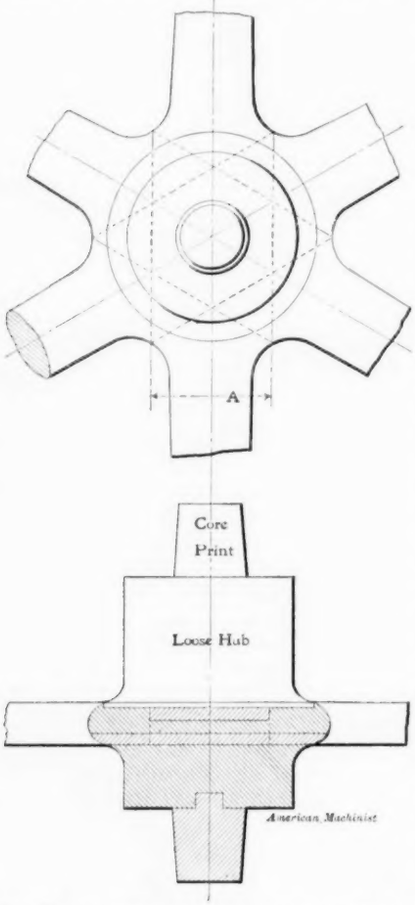
DIFFERENT WAYS OF MOLDING A PIECE.

most foundries would choose between the first two methods described. Personally I should choose the second. It is a good plan to study the different ways of molding a pattern and then choose the way that appears the best. Of course we wouldn't agree on that point. M. E. W.

Fastening the Arms of a Wheel Pattern.

Editor American Machinist:

In your issue No. 7, 1901, "Hobo" gives a method of fastening the spokes of small flywheel patterns. The accompanying sketches show a method which I have found to give a very durable job, and one



FASTENING THE ARMS OF A WHEEL PATTERN.

in some respects preferable to that given by "Hobo," although, as is evident, it is not applicable to wheels with an uneven number of arms.

The six arms, as shown in the sketches, are made of three through pieces joined together at the center in such a manner as to make each pair of arms continuous from rim to rim, and also giving each pair its share of the total thickness at the joint. The original pieces are taken of a width *A* equal to the radius of a circle drawn tangent to the fillets between the arms, and of a length equal to the diameter of the pattern. The width given is of course correct only for a six-arm wheel.

The lower or drag hub and core print are glued solid to the arms. The method of fastening the loose or cope hub is quite plainly shown in the sketch. Every molder knows how difficult it is to keep from damaging such thin edges as are shown on the loose hub in the sketch given by "Hobo," and this method of recessing the pattern and making the hub so as to extend into the pattern, say, ⅛ or 3-16 inch, gives an edge at the fillet that will stand the foundry use with little danger of being knocked off, and besides this it is its own dowel.

I apply the above method to all bosses which are filleted, whether they be loose or glued fast, and find it quite a saving in time, as the thin edges otherwise curl up when wet with glue and do not make a nice joint without a liberal use of sandpaper. G. F. D.

A Stuffing Box Suggestion.

Editor American Machinist:

In your issue No. 13, 1901, Mr. E. S. Newton opens up the subject of stuffing boxes. Before it is dropped I would like to suggest a construction of stuffing box to accommodate itself to the wearing down of the piston.

In horizontal engines, both the piston and crosshead tend to wear out of line, and of course take the rod with them. If the stuffing box could only partake of the side motion of the rod, the latter would undoubtedly be kept more easily packed. If the rods are in good condition and run in line, there is no trouble in keeping them from leaking. I know of one rod that does not leak with 90 pounds pressure, when the three ¾ nuts are screwed up to the gland with the fingers only, on a good quality of hemp packing. I believe, however, that it would be easier to make a stuffing box that would adjust itself to the rod, than to keep the piston and crosshead adjusted to it. The sketch shows a box intended for that purpose. The shell *k* holds the packing and gland, and these can float between the spring at the bottom of box and follower at the opposite end. A box of this kind will give soft packing a fair chance to keep a rod tight, and when it does have the chance, I know of nothing that is better.

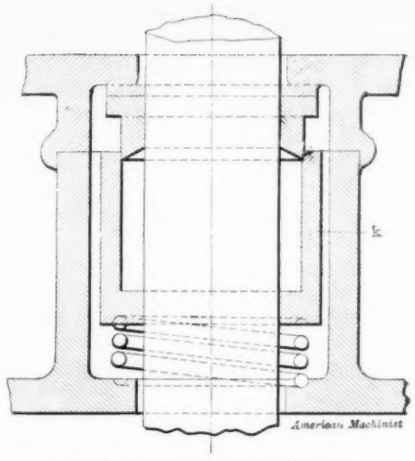
J. H. DUNBAR.

Making a Grate Frame Support for Locomotives.

Editor American Machinist:

I send a sketch of a pattern for a grate frame support; there is nothing complicated about it, and my object in sending it is to show a simple way of making it.

The pattern is parted in the middle and each half is kept in position by pins, as shown. Two pieces of pine, each 1¼ inches thick and wide and long enough to embrace the full size, were pinned together and band-sawed to the shape, as seen on the part where the letters *A* ap-



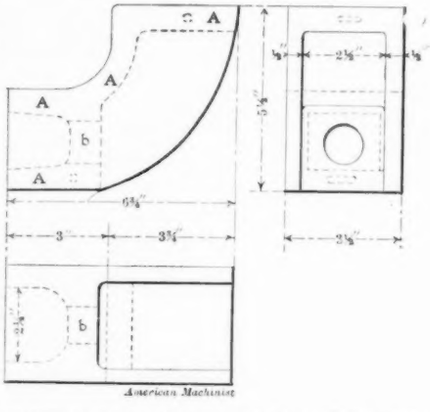
A SELF-ADJUSTING STUFFING BOX.

pear. The rib that has the hole *b* through was left solid until the two pieces, ½ inch thick, as seen at the right, were fastened in place, which gave the outline of pattern as seen at the left. The part marked 2¼ inches was made to size by gluing small blocks, one on each of the ½-inch pieces, inside and working to shape; then the hole was shaped in *b*, after which it was ready for shellacking. I know of no quicker way to make it; but some may object on account of its having to be molded in a three-part flask. WM. NEWTON.

Troubles of a Jobbing Shop Proprietor.

Editor American Machinst:

I am the owner and superintendent of a jobbing machine shop in a small town. This position I have gradually attained through economy, hard work and plenty



PATTERN FOR A GRATE FRAME SUPPORT FOR LOCOMOTIVES.

of thinking. When I entered this establishment as an apprentice, not so many years ago, there was a young machinist here upon whom much dependence was placed, he being considered a first-class, all-around man. After a time he was promoted to a position as master mechanic in a large mill, while I worked my way to the position I now hold. In my shop my chief ideas of success are cheap labor,

good supervision and not being afraid to soil my own hands.

As business has increased, my little gang of well-trained men have at last too much to do, so a short time ago I sent for an additional machinist from a nearby town. With the appearance of this newcomer our tidy little shop began to grow untidy. Bolts and nuts were scattered here and there, drills and taps were broken or improperly ground, cutting tools from different machines were found in places where they did not belong. At this stage I resolved to try another machinist, so I corresponded with a mill supply company, and was assured that a good man could be had for the proper wages. He arrived and was instructed to keep order around his machine and to do all work as quickly as possible without neglecting accuracy. He was started on the same class of work as one of my home-made machinists at a nearly double wage rate. For a few days all went well. Pay-day came, and as I paid the new man I felt that I was either doing myself an injustice, or that there were men leaving my works with about half what belonged to them. However, as the end of the next week approached, I began to discover certain things that led me to believe I had better make a discharge, and the sooner the better for the maintenance of my bank account. Next week I had a visit from the same machinist whom I mentioned in connection with the beginning of my shop career. He had by a change of officers lost his mill position. As quite a number of years had passed since he and I had worked together, and as he was much further advanced in years than I, it seemed advisable to give him employment; so next morning he started in, and again my hopes sank and my thoughts searched for the cause of my dissatisfaction.

It was here that I discovered myself doing work at prices too close to justify high wages. Then I began to think of other larger manufactories I had visited; how well every man seemed trained to the one class of work he was employed at; how little attention the superintendent paid to things as he ushered me through the works, showing me how many engine beds of a certain size were planed before the attending workmen were ordered to plane cylinders, and so on. Then my thoughts ran back to my little place, where the big lathe had to be blocked up to bore a small hub on a large wheel, or a special bar must be made, to carry away up on to the last floor of some refinery, to take a light cut out of a cylinder too large to be taken down and handled over rough wagon roads to the shop. How a customer complained when I charged him twice as much for a cylinder ring as the builders of his engine did, and, last of all, how I myself worked hour after hour on a breakdown job, molding a 36-inch spur gear from an old broken casting without a good tooth in it. What a nice job I made under the circumstances; but alas! when the bill was sent in, over came the mill foreman with a manufacturer's price list, and he showed me that I had charged twice the cost of the same from the catalog. At last I have decided that the job shop superintendent has quite a number of nuts to check before he learns which is the correct way, as did Mr. Osborne when he furnished that customer those pieces of shafting, "exactly 12 inches long."

C. A. P.

Some Points in Drawing Room Practice.

Editor American Machinist:

On many drawings, especially if made to a large scale, a wash of water color may be used in place of section lining. The effect is just as pleasing, quite as practical, and far more rapidly done. If the tracing is made upon the glossy side of the cloth it should be turned over and the wash applied to the back. It should be done as quickly as possible, with a good-sized brush, not too full of color, to avoid wrinkling the tracing cloth. Upon paper drawings less care is required, except that the color must be made to flow smoothly and evenly if it is to present a sightly appearance. Any color that is preferred may be used, india ink and the color known as neutral tint being favorites.

Small details such as angles and rails, when shown in section, look best when filled in with solid black ink, the same as used for the line work. The effect of a wash of water color may be produced by simply rubbing the tracing with a soft pencil, and colored pencils may be used for this purpose if desired. The objection to this method is that the tracing will not bear cleaning either with sponge, rubber or gasoline. The aniline copying pencils are more permanent, resisting the action of the rubber fairly well. In fact, it is almost impossible to entirely remove from a tracing marks made by one of these pencils.

In checking drawings, much time and trouble may be saved by using a pencil to tick off the correct dimensions and indicate changes, and, finally, when all corrections have been made, going over all the figures and checking them with red ink, in place of using ink in the first instance. Ink which is easily erased should be used for this purpose, so that in case a figure is changed at a subsequent time, the check-mark will be removed along with it, and the figure will not stand as a verified dimension until it, in turn, has also been checked.

Black center lines and dimension lines are favored by many in preference to the red ones more commonly used, the principal claim urged for the black lines being that they show more clearly upon the blueprint; but this is often a fault rather than a merit, as these lines should always be properly subordinate to those of the drawing. An effort is usually made to keep them so by making them thin and broken—that is, of dots and dashes—but this requires more time and the effect is rarely as good as that of the full red line, which shows upon a well-made blueprint to just about the degree required by its subordinate character.

The custom of putting a bill of material on detail drawings in place of writing the number required against each detail is becoming deservedly popular. On sheets containing many details, the bill of material is a concise and convenient list of all that is shown thereon; it is a great help to clerks who may have occasion to refer to various items upon drawings and who may be but little accustomed to reading them. It also leads to the practice of giving each detail a name and a mark which will not appear upon any other, unless one which is in every respect identical. In addition to this, it lessens the likelihood of the draftsman forgetting to state of what material each piece is to be made, as there is usually a column giving the number of parts required, another for the name of the part, a third for the mark by which it is to be known, which, in the case of castings, not infrequently forms the pattern number also. A fourth column gives the material of which it is to be made, while a fifth is reserved for remarks, such as reference to existing patterns, catalog numbers, etc. In special lines of work columns are also reserved for sizes, weights or any other information which it is desired should be systematically given. There are many items which may be mentioned in the bill which do not require to be drawn at all. Among these are standard flanges and fittings, couplings, pulleys, sheaves, hand-wheels, etc., as also bolts and set-screws, where these latter small items are required to be called for.

The "Blueprint Book," or set of tables of standards, the draftsman's almost constant companion, can be made of more than ordinary utility if proper attention is paid to its construction. The size of sheet usually adopted for this purpose is too large for convenience, and the tables are seldom arranged so as to admit of the quickest reference to the dimensions required. Furthermore, there are many subjects given in the form of tables which should never be so presented. The custom commonly followed of making one small detail of a flange, fitting, pulley, coupling, wheel or other part of a machine, with letters in place of dimensions, and then constructing a table of standard proportions to be used by first finding the letter on the detail and then laboriously seeking the corresponding figure in the table, is one that has very little to recommend it. A separate diagram for each size, with the figures given directly upon it in the proper order, takes but little

longer to construct than a table of dimensions and will pay for itself many times over by reason of its giving the information sought for directly, in place of doing so in a roundabout manner. These diagrams do not require to be drawn to scale, and their proportions may be exaggerated to admit of the more readily placing dimensions upon them. In preparing such a set, a drawing is first made of one diagram and from this as many points are made as may be required. These latter are then arranged upon a board and a tracing made of them all at once, filling in each with the dimensions proper to the size which it is intended to represent. In addition to the ease with which these diagrams can be read, compared with a table of dimensions, they are often used in the shop, serving all the purposes of a regular working drawing. As above observed, there results a decided advantage from making these sheets of a size small enough to be conveniently handled, and by the use of these separated diagrams the sheets may be kept within any desired limits. Even the 6x9-inch size is too large for convenience in use, while 4x6-inch can be pasted as supplementary pages in any of the various pocket books of which the draftsman may be making most frequent use, and so become most immediately available. It is worthy of note, also, that 4x6-inch is a stock size for card index cabinets, which furnish a convenient means of filing the sheets when they become numerous. GERALD E. FLANAGAN.

A Strike in the Bollinckx Works in Brussels.

Editor American Machinist:

We read in the columns of "American Machinist" that a strike occurred in the National Cash Register Company of Dayton. The same thing has arrived in our works. Three molders were discharged, and as we refused to reinstate them all the foundrymen struck for their reinstatement. What is going too far is that they acknowledge we were right when discharging these men, but at the same time they found the reason not sufficient. The real reason is that they would like to reduce the production; that we became aware of, thanks to the premium system.

The three men were discharged because they had reduced their production.

If we point out this thing to you, it is because we do for the workmen all we can to improve their condition, just as the National Cash Register do, and to show you that ingratitude may be met in every country. When the foundrymen struck we also shut down the works.

ARTHUR BOLLINCKX.

Brussels, Belgium.

Four Ifs—The Nine-Hour Day.

Editor American Machinist:

IF—The operative machinists had simply demanded the "nine-hour working day" is there any doubt but that they would have gotten it?

IF—They had relied upon the increased demand for their labor thus created, would not their daily earnings have been restored to the ten-hour figure very soon, and in many cases immediately?

IF—Employers had realized that the time has come when the productive capacity of the American mechanic has been raised to the point where it successfully defies the competition of Europe in Europe itself, and that the demand for a nine-hour day is timely and reasonable—

IF—The employees would realize that they cannot run their employer's business without ruining it, and that they need the brains, capital, enterprise and ingenuity of their employers to make their labor of value—

Then there could be no strike.

Not on the part of the exceptionally bright citizens who rank as good mechanics.

Then there would have been a chance for the employers to adapt themselves to new conditions.

Then, by additional ingenuity, of which there is a large amount in reserve, we could have maintained the supremacy of American machinery in the markets of the world without a single doubt.

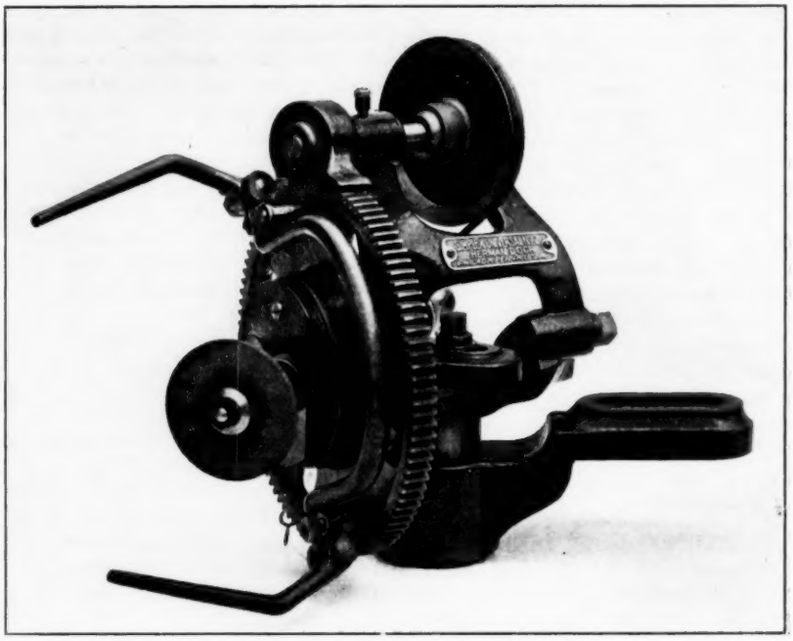
Now there is doubt. Now there is a constant irreparable loss. Stop it. Get together, man to man, on this simple basis: "A nine-hour day for American mechanics."

EMPLOYER.

Some New Things.

A NEW LATHE CENTER GRINDER.

The half-tone shows a center grinder which combines an unusual number of ingenious and practically valuable features. It is entirely self-contained and may be used upon any lathe of, say, from 12 to 60-inch swing, being driven by two equalizing and self-adjusting pins, which project into opposite slots of the face-plate, so that the driver is always balanced and central. The pins, which are jointed and may be moved in or out to accommodate the slots, give motion to the large spur gear and this to a pinion shaft above, and then by an elastic helical belt to the grinder spindle. The ratio of speeds of gear to emery wheel is 1 to 24, so that with a moderate speed for the face-plate a high speed is given the grinder. While the large gear is a true spur gear the pinion is helical, so that its shaft stands at an oblique angle, which gives an easy run for the belt to the grinder. The slotted holder of the grinder is placed upon the lathe rest in place of the tool-post and secured by a single bolt, which comes with it, and then a split hub in this holder enables the body of the grinder to be raised or lowered and swung around until two centers in the front and rear of the casting are brought to coincide with the lathe centers, when the split hub may be tightened, holding the grinder securely and in correct position. The grinder spindle may then be swung around and adjusted by graduations provided according to the angle to which it is determined to grind the center, the graduations ranging from 55 to 90 degrees. When the grinder spindle is swung around, the bracket which carries the helical pinion shaft also swings upon the axis of the large gear, so that its mesh is always unchanged while the angle for the belt is corrected. In the operation of grinding, the spindle is moved back and forth by hand. It is perfectly protected from dust, whatever its movement may be. Covered oilers are provided for all the bearings and the grinder

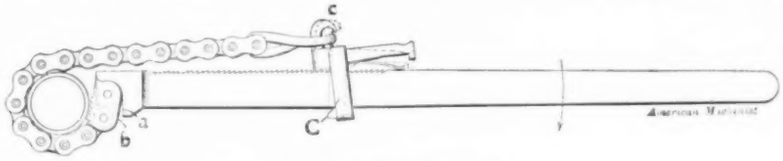


A NEW LATHE CENTER GRINDER.

is well made throughout. It is called the Simplex universal center grinder, and is made by Herman Dock, 905 North Carlisle street, Philadelphia.

A HANDY PIPE WRENCH.

The cut shows a recently patented chain pipe wrench, which will be readily understood. The chain is passed around the pipe and hooked on to the horn *c*, when the entire piece *C* is slid along the bar as far as possible and secured by the small ratchet teeth on the edge of it. This is done while there is still a wide angle open at *a b;* then, upon moving the lever downward, or in the direction of the arrow, this angle is reduced or closed and



A HANDY PIPE WRENCH.

a strong tension is produced on the chain. On moving the lever in the opposite direction, the chain is at once slackened enough to allow it to be unfastened. The Trimont Manufacturing Company, Boston and Portland, is the assignee of the patent.

The New S. S. "Apache."

The new steamship "Apache" of the Clyde Line fleet left New York on her maiden voyage for the South on the 18th. A few hours before sailing a very pleasant gathering of newspaper men took place on board the vessel and luncheon was served. The "Apache" was built by the Cramps, is 310 feet long, 46 feet wide, 31 feet deep, has capacity for 3,000 tons of cargo and speed of 15 knots. There are accommodations for about 200 passengers all entirely above the upper deck. She is a very nice vessel. The chief engineer nearly had a fit when our representative asked him for a few of the leading facts about the engine and boilers. She is, however, a single-screw vessel with a triple cylinder engine, probably without special features of interest.

Examinations for Mechanical Draftsman, Etc.

The United States Civil Service Commission, Washington, D. C., announces that on August 20-22, 1901, an examination will be held in any city in the United States where postal free delivery has been established for the position of mechanical draftsman in the testing department, at the Watertown Arsenal, Massachusetts, and other similar vacancies as they may occur. Persons who desire to compete should at once apply to the Commission, for application forms 304 and 375 and a copy of the Manual of Examinations, revised to January 1, 1901, which explains the scope of the examination. An examination for the position of aid in the Coast and Geodetic Survey is announced by the Commission for July 23.

Inquiry for Machinery.

(152) Wanted, names and addresses of manufacturers of machines for sharpening slate pencils.

Personal.

G. L. Crook, superintendent of the American Turret Lathe Company, Wilmington, Del., sailed for Europe June 22 on the "Umbria," in the interest of his company, to be gone two or three months.

Cecil B. Smith, member Can. Soc. C. E., assistant engineer City Engineer's Department, Toronto, Can., and formerly assistant professor of civil engineering McGill University, and Wm. S. Aldrich, member Am. Inst. E. E., member Am. Soc. M. E., professor of electrical engineering University of Illinois, have opened an office as consulting engineers, Rooms 101-103, Mail and Express Building, Toronto, Can.

Our esteemed contributor, Mr. Robert I. Clegg, of Providence, R. I., has become mechanical editor of "The Iron Trade Review," of Cleveland, Ohio. Mr. Clegg is a native of England, where he served an apprenticeship and worked for some time in the machine shops. He came to this country in the 80's and he filled several positions with high success. He has been a valued contributor to our columns, and we are glad to add another to the list of those who have through our pages taken positions of responsibility and usefulness with other journals.

A Statement by the National Cash Register Company to its Employees and to the Public.

Dayton, O., June 3, 1901.

The National Cash Register Company has never been opposed to labor unions. It is not now. It does not wish to oppose them. Its officers believe that labor has often been abused and neglected and underpaid, and that some organization or union among laboring men has been an aid and necessity to them. This company has been willing that its employees should join or organize unions, and has been willing that they should manage them in their own way. Most, or nearly all, of the departments in its factory have employees that belong to labor unions. This company has aimed to lead the way among all others to better the conditions of its employees. In doing so, it has expended each year large sums of money—as much as 2 per cent. of its pay rolls—and occupied much of the valuable time of its officers. About four years ago the company voluntarily reduced the number of working hours of all its men from ten to nine and one-half hours, without reducing pay. This company has ever since given all its men ten hours' pay for nine and one-half hours' work. This was the condition of things when some of its men went on strike May 3. This reduced the capacity of the company's plant, cost it 5 per cent. of its factory pay roll, which 5 per cent. amounted to $10,000 during the last fiscal year. The more exact dates as to time of this reduction are as follows:

Men—During all of 1894 and 1895 and up to July, 1896, ten hours.

After July, 1896, to the end of that year, nine and three-fourth hours.

Beginning 1897, and since, nine and one-half hours.

Women—During 1894, ten hours.

During 1895, nine and one-half hours.

1896 and since, eight hours.

PAY THE STRIKING MEN RECEIVE.

The foregoing are no reasons why we should not pay our men good wages. We did; in no case paying less, and we have been, in most cases, paying more than the union scale. If we have been also working less hours than the union required, why have we not been voluntarily fulfilling the very conditions which unionism claims it seeks to establish?

1. There were twenty-seven molders in the foundry when they were ordered to quit work. The molders, when they quit, were all earning from $4.00 to $4.50 per day of nine hours. They were all working on piece work. They were all putting up their limit of work. Their union forbade them to do more work or earn more money.

2. There were 109 men in the polishing department when they quit. The polishers, when they struck, were getting $3.50 or $4.00 per day, the prices their union fixed for the different classes of work. They were nearly all working on piece work. They were all putting up their limit of work. Their union forbade them to do more work or earn more money.

MACHINES MADE IN DAYTON TO BE SENT ABROAD.

Nearly one-third of all the registers now made by our company in Dayton are shipped abroad and sold in foreign countries. Patent protection to us is limited in Canada and in many foreign countries, because we do not make our goods or employ our labor there. We pay, besides, heavy tariff to get our manufactured goods into these foreign countries. We have continued thus far, at this great disadvantage, only in order to employ all our labor here.

COMPLAINTS.

1. When on May 3 the men in our foundry and polishing rooms struck, we had that day, and previously, met their committee and discussed their grievance, which is shown below. They said they would strike if their demand was not granted at 2 o'clock on that day. Our company answered them in writing as follows:

"We are willing to arbitrate. We appoint two, your organization two, they the fifth.

"R. PATTERSON, JR.,
"General Manager."

Their answer, by Mr. Dutle, was as follows:

"The organization says they have nothing to arbitrate. The men will go out at 2 o'clock."

They went out ten minutes later. Our company then posted the following:

NOTICE.

"Owing to our inability to get material enough for our output because of certain labor troubles with our employees in the foundry and polishing room, which we have been and are still willing to arbitrate, this factory necessarily will be closed this evening until further notice.

"BOARD OF DIRECTORS
"Of National Cash Register Company.
"May 3, 1901."

2. Part of this company's system has been

to offer prizes to its workmen for suggestions as to how the quality of its work could be improved and its cost lessened. The Metal Polishers' Union, which struck, have sent in practically no suggestions. They have discouraged any of their number doing so. The Assemblers' and Adjusters' Union has formally received and is hearing complaints against its members for sending in valuable suggestions of this kind.

3. The Amalgamated Wood Workers discriminated against us in prices in this city. Making boxes for us, they require us to pay $2.00 per day. Doing the same work at the same time for others in the city and for our use they allow $1.50 per day to be paid. That is, to get our work done by others employing union labor in the city costs us less than the union requires us to pay if we did the work ours lves in our own factory.

4. One union in our factory is the Amalgamated Wood Workers, comprising our bench men, mill men and boxmakers, about seventy in number. Another union is the Carpenters and Joiners, who work around the factory, comprising about eighteen men. These two unions quarreled between themselves about their control of certain work, each claiming to control it. It was none of our affair, but theirs alone; but it took much of our time and obstructed our work. Mr. Kidd, the higher official, was called from Chicago by one of the unions at our request, and an agreement was made which he approved. We complied with it. Thereupon the other of these unions whom the decision had gone against struck on Tuesday, April 16, last, and have been out ever since. This strike was not because of any complaint against us. It delayed and injured our business. These men have been striking and out of our employment, and only for the reason stated, for the last five weeks. They are now out. They claim to hold their places in our factory, but many of them are working for other people while they hold our work tied up.

5. Within the last year our drivers were formed into a union. Already they have twice struck and quit work, and delayed and obstructed us, without any previous complaint to us or grievance. The union also stopped the delivery of our coal by an outside contractor, and nearly closed our works, not because of any affair of ours or complaints against us, but because they wanted us to compel the party from whom we bought our coal on contract to get his drivers unionized before they delivered coal here.

6. The striking Molders' and Polishers' Union last year compelled this company, in order to escape reinstating men whom it did not require, and to prevent a strike to pay them their wages for three months for work they did not do at all, and covering time that they did not come to the factory, except to draw their weekly pay.

7. The Molder's Union demanded that this company reinstate in its employ four molders, two of whom had been discharged January last for want of work, and two of whom were discharged in April last, one for excessive losses in his product, which means bad and incompetent work, and the other for the use of filthy and abusive language in the shop and for insubordination. Before the foreman discharged either of these last two men, he reported the facts fully to the general manager, who investigated and satisfied himself that the foreman's complaints were justified, and approved and ordered the discharge to be made by the foreman.

8. A large part of the valuable time of the officers here, needed for business, has been taken up with the complaints and differences among twenty-five of these union organizations in our factory and in getting elaborate agreements with some of them in the hope of preventing trouble. Some of them wholly disregard all agreements which they make. The Amalgamated Wood Workers repeatedly violated their agreements until a great deal of time was given to getting a distinct understanding and written contract with them.

(Continued on next page.)

Miscellaneous Wants.

Advertisements will be inserted under this head at 25 cents a line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Gear Wheels, gear cutting. Grant; see p. 22.

Caliper cat. free. E. G. Smith, Columbia, Pa.

Punches & dies. Wal.M.Wks., Waltham, Mass.

Light and one mach'y to order; models and elec. work specialty. E. O. Chase, Newark, N. J.

Book "Dies and Diemaking," $1, post paid. J.L.Lucas, Bridgeport, Ct. Send for index sheet.

Selden Packing for Stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., New York.

See 12 presses & dies for sheet-metals, S. E. cor. Machinery Hall, Buffalo Exposition. Ferracute Mch. Co., Bridgeton, N. J.

Wanted—A good second-hand electric locomotive. Address, with particulars and price, P. O. Box 2023, Bridgeport, Conn.

F. J. Stokes Machine Co., 13th and Noble sts., Philadelphia, cut light gears, cams and duplicate small machine parts, in quantities.

Partner wanted; one who can bring business for 8 or 10 men and is able to run shop; I have capital and tools. "Partner," Box 196, AMERICAN MACHINIST.

For Sale—1 Riehle 200,000 lb. testing machine, 1 Riehle 10,000 lb. testing machine. For particulars and prices apply to J. Adriance Bush, 100 Broadway, New York City.

Wanted—Engine, a Buckeye, in good order, with cylinder from 9 to 12 in. diameter, either high speed or girder bed. Address, with all particulars, W. E. Caldwell Co., Brook and D st., Louisville, Ky.

Small capital wanted for a new line of machinery relating to wood and metal working industries, protected by controlling patents allowed; large field, practically untouched. Address Box 236, AMERICAN MACHINIST.

Two hand-colored tempering charts (A and B), 36 steel-working receipts and free sample of Monarch Welding Compound, all for $1; these cover all difficult steel working; invaluable to machinists. W. M. Toy, Sidney, Ohio (40 years a steel worker).

Institutions retiring from business having machine tools, brass and wood working machinery will find it to their interest to correspond with us. We purchase complete plants or handle them on com. C. C. Wormer Mach. Co., 55-59 Woodbridge st., W., Detroit, Mich.

"No junk at half price sale."—On account of other interests needing my attention, will sell one of the best equipped foundry and machine shops in the best city for business and health in Texas for $25,000; $5,000 cash; balance, 1 to 10 years. R. W. Lewis, 222 Garden st., San Antonio, Texas.

A contract in use thirty years; never broken by an apprentice; every machine shop or factory should use it; will send copy for $1; if not satisfactory will return your money. George W. Merrill, 1022 S. Jefferson ave., Saginaw, Mich. Reference, by permission, People's Savings Bank, Saginaw, Mich.

Set of Bound Volumes for Sale.—We have for sale a set of bound volumes of the "American Machinist" from Vol. 3 to 18, inclusive; all in good condition; ten are bound in morrocco and six in cloth; leather-bound volumes have name of a former editorial writer on side; cloth-bound volumes unmarked; the entire set for sale at $4 per volume; a chance not often found; first order takes the books. AMERICAN MACHINIST PRESS, 218 William st., New York. (P. S.—One volume of Vol. 8 for sale at $2.)

Wants.

Situation and Help Advertisements only inserted under this head. Rate 25 cents a line for each insertion. About six words make a line. No advertisement under two lines accepted, and no advertisements abbreviated. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded; but replies will not be returned. If not forwarded they will be destroyed without notice. Original letters of recommendation or other papers of value should not be inclosed to unknown correspondents.

Situations Wanted.

Mechanical draftsman wishes position. Address Box 255, AMERICAN MACHINIST.

Draftsman, 3 years' experience, wants position. O. B., Box 247, AMER. MACHINIST.

Young man wants position; general tool work, gage, jig and die work. Box 215, A. M.

Technical graduate, 30, experienced shop and drafting, wants position. Box 243, A. M.

Position as stationary engineer; thoroughly understands electric power plant. Box 223, AMERICAN MACHINIST.

Wanted—Position, by mechanical and electrical draftsman; A1 references. Box 238, AMERICAN MACHINIST.

Foreman, general jobbing and repairs, desires change; 10 years foreman; references. Box 242, AMERICAN MACHINIST.

Technical graduate, first-class draftsman, with complete shop experience, wants position. T. T., care AMERICAN MACHINIST.

Wanted—Responsible position for competent men of mechanical experience. Address James Brady, 220 Broadway, New York.

Young German, practiced 1½ years in engine tool works and has 4 years' technical training, desires suitable position. Box 216, AMERICAN MACHINIST.

Experienced mechanical draftsman and designer, technical education, wishes position; Eastern locality preferred. Address Box 221, AMERICAN MACHINIST.

Wanted—Position as manager or superintendent of engine or machine tool shop; now holding first-class position, but desires a change; age 36. Box 214, AMER. MACH.

Superintendent, with 20 years' experience in light metal manufacturing by most approved modern methods, wishes to make a change. Box 250, AMERICAN MACHINIST.

Automatic screw machine foreman, who thoroughly understands his business, wishes to change; 20 years' experience, 8 as foreman. P and Q, care AMERICAN MACHINIST.

Position as draftsman wanted by a young Swede; went through the mech. drawing division in Scranton Correspondence Schools; 9 years' foundry experience. Box 237, AM. M.

Mechanical engineer, of practical experience from the power plant to production, as foreman and master mechanic, solicits correspondence. Box 239, AMERICAN MACHINIST.

Position as superintendent; capable of handling men to a good advantage and reducing costs by labor-saving devices; will purchase interest in a reliable concern. Box 177, AMERICAN MACHINIST.

Polishing room foreman, with 20 years' experience in four of the largest shops in the East wishes to make a change; references cheerfully given to interested parties. Box 249, AMERICAN MACHINIST.

Situation wanted by all-around, practical foreman blacksmith; thoroughly familiar with steam and drop hammers, case-hardening and tempering, etc.; reliable man; references. Address B., 2087 Dean st., Brooklyn, N. Y.

A thorough, up-to-date machinist of practical inventive ability, good designer, well experienced, systematic, used to take charge, wants suitable position to make full use of his ability. Box 244, AMER. MACHINIST.

Experienced engineer open for engagement as superintendent, assistant superintendent or chief draftsman; 18 years 'experience, covering machine tools, electrical machinery and rolling mills. Box 240, AMER. MACHINIST.

Position as superintendent or general foreman; am conversant with the machine business in all its branches, a designer of tools, jigs and modern appliances for economical production. Box 217, AMERICAN MACHINIST.

By an experienced machinist, within 30 miles of Hartford, Conn., as foreman or superintendent, or getting up new machines, tools and fixtures to reduce cost; can handle men to best advantage. Address Box 248, AM. M.

Mechanical engineer and draftsman, age 38, experienced in designing, estimating and building both light and heavy hydraulic and special machinery, desires to associate himself with good concern. Box 245, AM. MACH.

Engineer's License.—Machinists, engineers, firemen, electricians, etc.; 40-page pamphlet containing questions asked by Examining Board of Engineers sent free. Geo. A. Zeller, Publisher, Room 336, 18 S. 4th St., St. Louis, Mo.

A designer of special automatic machinery, who is at the present time designing machinery for the manufacture of valves and fit-

tings for one of the leading companies, desires to make a change and would like to communicate with some valve company who are in need of special machinery. Box 246, AMERICAN MACHINIST.

Superintendent of unquestionable executive ability and broad experience, thorough mechanic, both practical and theoretical, familiar with up-to-date cost-keeping systems and shop management, at present in charge of large concern, American, age 36, will be open for engagement July 1. Address Box 175, AMERICAN MACHINIST.

Help Wanted.

Wanted—Good machinists at Detroit, Mich. Address Box 195, AMERICAN MACHINIST.

Wanted—Two first-class operators on Gisholt turret lathe. Box 185, AMER. MACH.

Foreman brass molder; one thoroughly accustomed to plumbers' and engineers' brass goods. Box 230, AMERICAN MACHINIST.

Wanted—Experienced master mechanic for large paper mill; state age, experience and salary. Box 241, AMERICAN MACHINIST.

A mechanical draftsman wanted for special machinery. Address, with references, age and salary expected. Box 227, AMER. MACH.

Wanted—First-class toolmaker on iron body gate and globe valves; liberal wages; give experience and age. Box 200, AM. M.

Wanted—A man who thoroughly understands making dies for sheet iron work. Address "Die Maker," care AMER. MACHINIST.

Mechanical Draftsman.—Wanted—Draftsman familiar with machine tool drawings. Fitchburg Machine Works, Fitchburg, Mass.

Good patternmakers, both wood and metal, desiring steady employment, will find it to their advantage to apply to the General Electric Co., Schenectady, N. Y.

Wanted—Six erecting foremen experienced on machine tool work; state with what firms experience was gained, age and wages expected. Box 229, AMERICAN MACHINIST.

Wanted—20 first-class machinists; men accustomed to doing fine close work; we have no strike here and never had a strike. Vermont Farm Machine Co., Bellows Falls, Vt.

Wanted—Foreman for turret lathe department; permanent position for right man; give age, nationality, experience and wages expected. Box 228, AMERICAN MACHINIST.

We invite applications from machinists and molders; give references, experience and wages expected; work on air compressors. Franklin Air Compressor Co., Franklin, Pa.

Wanted—Machinists to work in shop in Western Pennsylvania building engines and general machinery; lathe and planer men preferred; give age and experience. Box 251, AMERICAN MACHINIST.

Wanted—Good, all-around, non-union machinists, by a concern building gas engines, located in Central States; steady work for capable men; give experience and wages expected to receive answer. Box 253, AM. M.

We are enlarging our works, and will shortly require an increased number of skilled mechanics; we invite application from pattern makers, molders and machinists. Address the Westinghouse Machine Company, East Pittsburgh, Pa.

Machinists, lathe men and assemblers wanted in a New England shop that has not laid off hands in years; healthy location, good work and wages. Give name of last employer, or send recommendation to Box 254, AMERICAN MACHINIST.

Wanted—A bright, energetic young man as assistant to superintendent of manufacturing plant employing about 125 men; a technical graduate preferred; give full personal particulars, previous experience, salary received in last position and references. Box 226, A. M.

Wanted—Experienced foreman for lathe department, containing thirty 14 to 20 in. lathes, by an established concern building a great variety of high-grade special machinery; all work made from first-class drawings; permanent position and good pay to the right man; reference required. Box 234, AM. M.

Wanted—Experienced man as working foreman to take charge of milling job in machine shop having several universal, plain and vertical machines; must be able to work from drawings and handle help advantageously; permanent position and good pay to the right man; reference required. Box 235, A. M.

A successful manufacturing concern desires to add another department, where its foundry, machine, smith, pattern and carpenter shops can be utilized; a man of energy and brains will receive a growing salary and encouragement in developing and managing any meritorious specialty; correspondence solicited; strictly confidential. Box 233, A. M.

Wanted—General shop superintendent for bolt and nut works in Australia; moderate sized plant; equipped with new American tools; must be competent draftsman, energetic and have executive ability; if capable of filling the position will be made manager; give full experience and references. Address Cleveland Twist Drill Co., Cleveland, Ohio.

Wanted—As superintendent's assistant in a drop forging plant, a young man of good technical education who has served his time as machinist and has some knowledge of drawing; a first-class man, quick to understand and plan new work, and who can develop ability to get best results from subordinates is wanted; previous experience in forgings not essential. Address Box 231, AMERICAN MACHINIST.

Wanted—A first-class machinist foreman to take charge of small machine and interchangeable work in established shops manufacturing instruments of precision; must have up-to-date ideas of manufacturing rapidly and well with modern tools and first-class executive ability in handling men; good opening for the right man; state age, experience, salary desired and give references. Box 232, AMERICAN MACHINIST.

We have a new and modern plant, employing about 40 men in the manufacture of our own patented specialties; we want to correspond with a capable and experienced superintendent who is well up in modern machine shop practice, competent to design and make special tools, jigs and fixtures for interchangeable work on turret lathes. Address, in confidence, stating age, experience and salary expected, Box 252, AMER. MACHINIST.

Draftsmen Wanted.

We have positions open for capable, experienced Mechanical Draftsmen. Our business is to assist Draftsmen and Engineers (technical men only) to secure positions when unemployed, and to better their positions when employed. Our business was established in 1893.

No registration fee.

THE ENGINEERING AGENCY,
1605 Monadnock Block, CHICAGO.

Wanted.

NON-UNION MACHINISTS.

Tool-makers, good all around Machinists, Erecting hands and Filers. Good Pay, Permanent Positions.

AMERICAN ORDNANCE CO.,
BRIDGEPORT, CONN.

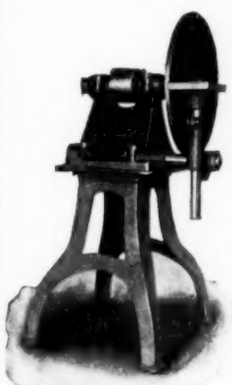
RECEIVER'S SALE,

Known as the T. H. Risdon Turbine Water Wheel Plant, July 11, 1901.

Real Estate, Tools, Machinery and Fixtures, Patents and all other property of the John W. Taylor Manufacturing Co.

For full description of property, address

JNO. B. DAVIS, RECEIVER.
Mount Holly, N. J.



23-inch Disc Grinder.

It Costs

50 per cent. less than milling.

500 per cent. less than the man with the file, to finish flats or bevels with

Our 23-inch Disc Grinder.

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(*Continued from preceding page.*)

Our officers declined to do this until their higher official, Mr. Kidd, of Chicago, was present and concurred in what the men did, and signed the written agreement and contract with our company, which they made. This written contract was dated March 28, 1901. It was to take effect "April 1, and be effective for one year." It was formally signed as follows:

"D. P. FARRELL,
"Signed for the Union.
"ROBERT PATTERSON, JR.,
"Signed for the Company.
"THOS. I. KIDD,
"For International Union.
"SELMA WHITCOMB,
"For the Shop Committee."

By its terms the men of this union obtained a number of valuable concessions which our company carried out. Its clause 10 expressly provided:

"That in case of any difference between the N. C. R. Company and the members of the Amalgamated Wood Workers, no strike shall be declared until the general officers of the Amalgamated Union have investigated and endeavored to adjust the question in dispute."

The men of this union violated this provision for the purpose of obstructing and injuring us.

The difference arose on slackness of work. They stated the difference to us, and their sole right and duty in consequence was, as this clause provided, to refrain from striking until their own general officers investigated and tried to adjust the question in dispute. In the middle of the morning those men laid down their tools and walked out in a body from the shop. In order to prevent a strike, the company conceded what it ought not to have conceded and induced the men to return. A week later, the men in this union did the same thing over again. They walked out in a body in the middle of the morning and stayed out until the following Monday morning. The company conceded, as it should not have done, the point in question, and the men resumed work.

These men in this union thus, by the terms of a written contract, approved by their superior officers, obtained from us valuable concessions in consideration of refraining from injuring us by strikes, until a proper and fixed method of adjustment of differences should be arrived at. This method was their own agreement and such as their union required. They never paid any attention to their agreement with us nor to the requirements of their own organization. We filed a complaint with their superior officials in Chicago, who heard the matter afterwards. Their sole excuse was that they did not strike, but merely quit work in a body and stayed out. Their own official pronounced their excuse and reason unjustifiable, but they have kept, and propose to keep the benefit of their abuses when their own organization has found them to be in the wrong.

9. Since our factory was closed we told the committee of the molders and polishers that we were ready to confer with them about our differences and would confer with any of our striking unions. We met the molders' and polishers' committee, Mr. Gompers, president of the American Federation of Labor, and Mr. Kidd, general secretary of the Amalgamated Wood Workers, who came with this committee. The conference was protracted two days. Various suggestions for arbitration of the one complaint of the Molders' Union against us, and of our many complaints against them and other unions, were discussed, but no agreement arrived at. President Patterson finally offered to reopen our factory on Monday, June 3, with the understanding that neither party should now press

their complaints against the other, but waive them for the present. The union asked time to consider this over night. Then they returned and stated they were unwilling to accept it unless these four men were reinstated.

The president and vice-president always did, and do yet, own the controlling stock of this company. They want to say to all its employees:

We have built up this great industry in sixteen years by hard work. We have been able to erect buildings and extend our business by obtaining one million dollars ($1,000,000) from the sale of preferred stock. Our success has been won under our own system that you know, and under which we have lived in harmony and mutual respect. Its essentials are liberal pay, shortened hours, mutual acquaintance, considerate treatment, co-operation with loyalty to our business and all who are members of it. No less essential has been its rule that the company should select and discharge its employees, who are to be consulted about, but not to finally determine the instructions they receive. To demand that a subordinate shall control this company is to introduce into our system a foreign and a hostile element.

We regret that a few men have caused our 2,300 factory employees to lose a pay roll of $5,000 per day, which has already amounted to $120,000. We are at present ready and willing to open our factory with the same employees we had on our pay roll when it closed. Respectfully yours,

NATIONAL CASH REGISTER COMPANY.
By JOHN H. PATTERSON, President.
Dayton, Ohio, June 1, 1901.

New Corporations.

Mechanical Improvements Co., of New York city; to handle inventions and patents; capital, $1,000. Directors: E. B. Hess, J. S. Stoughton and L. C. Myers, of New York city.

Passaic Metal Ware Co.; principal office, 257 Main avenue, Passaic, N. J.; object, manufacturing tin and metal ware; capital, $50,000. Incorporators: Wm. R. Ryan, Wm. P. Huxley and Wm. H. Stemmerman.

Newark Crucible Steel Co.; principal office, 15 Exchange place, Jersey City, N. J.; object, manufacturing iron and steel; capital, $100,000. Incorporators: George Surand, Paul W. Ryder, Leonard M. Ridgway.

American Pneumatic Horse Collar Co.; capital, $2,000,000; to manufacture pneumatic horse collars. Incorporators: Henderson B. Hays, of New York; George W. Flaacke, of Jersey City; A. Livingston Norman, of New York.

Hundley Heating Furnace Co.; principal office, 185 Montgomery street, Jersey City, N. J.; object, manufacturing furnaces, heaters, stoves, etc.; capital, $100,000. Incorporators: Ralph McKee and John W. Avery and George R. Allison.

Pennsylvania Metal Co.; principal office, New Jersey Corporation Guarantee & Trust Co. Building, Camden, N. J.; object, manufacturing metals; capital, $750,000. Incorporators: Frederick W. Van Nortwick, Morris L. Zimmerman and Emanuel J. Lupin.

Manufacturers.

The Spring City Bloom Works, Spring City, Pa., have been burned.

O. M. Savels & Co., Worcester, Mass., will erect a new die cutting shop.

The Mutual Wheel Company, Moline, Ill., will build an addition to its factory.

The United States Carbon Company, Cleveland, O., may expand its plant shortly.

(*Continued on next page.*)

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By Prof. T. O'Conor Sloane. Price, $5.00
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By H. T. C. Kraus, C. E. Price, $2.50
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New, revised and enlarged edition. Price, $1.00
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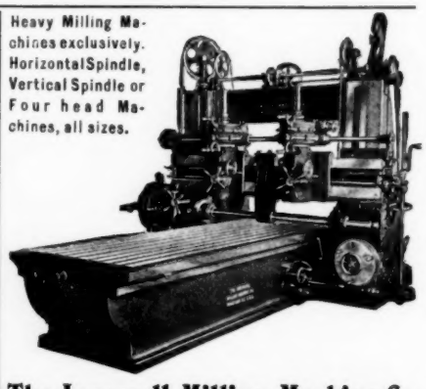

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